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Ground Cloud Dispersion Measurements During the Titan IV Mission #K23 (14 May 1995) at Cape Canaveral Air Station
Volume 1—Test Overview and Data Summary

27 February 1996

Assembled by

Environmental Systems Directorate
Systems Engineering
Space Launch Operations

Prepared for

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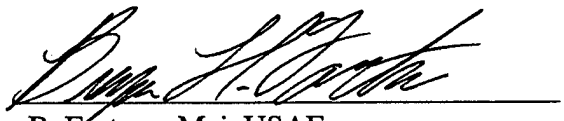

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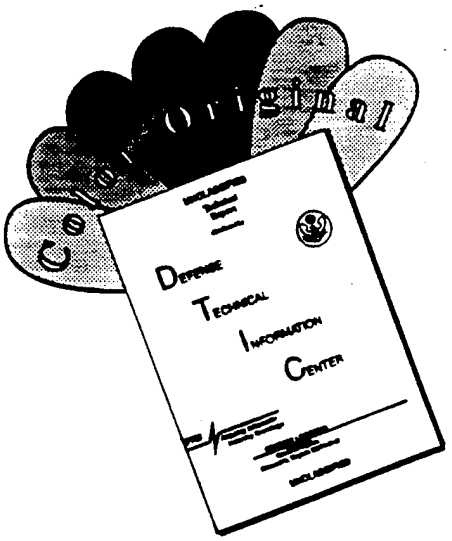

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13. ABSTRACT (*Maximum 200 words*)

Launch plume imagery, airborne and ground-level HCl measurement results and meteorological data determined during the launch of a Titan IV vehicle at Cape Canaveral Air Station (CCAS) on 14 May 1995 (mission #K23) are presented. These data will be used to determine the accuracy of the Rocket Exhaust Effluent Diffusion Model (REEDM). The imagery and aircraft-based HCl measurements indicate that the plume separated into ground-cloud and launch-column segments below and above 2000 meters, respectively, that took northeast and southeast trajectories out to sea consistent with rawinsonde data. The ground cloud's stabilization height was twice that predicted by REEDM.

Of numerous deployed dosimeters, large HCl responses (≥100 ppm-min) were obtained only for dosimeters on four lightning towers surrounding the pad and at a southeasterly position on the perimeter fence 180 meters away. REEDM predicted that a low-level inversion layer would prevent the cloud from diffusing back to ground. Aircraft HCl measurements briefly performed at altitudes as low as 400 meters 50 min after launch and 16 km from the pad detected only low levels (0.1–0.5 ppm) of HCl.

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Preface

The Air Force's Space and Missile Systems Center's Titan Systems Program Office (SMC/ME) is sponsoring the Atmospheric Dispersion Model Validation Program (MVP). This program will determine the accuracy of atmospheric dispersion models such as REEDM in predicting toxic hazard corridors at the launch ranges. This report presents launch cloud dispersion and meteorological measurements performed during the #K23 mission's Titan IV launch at CCAS as part of the MVP effort.

An MVP Integrated Product Team (IPT) led by Lt J. Schorie (SMC/MEEM) has been directing the MVP effort. H. Lundblad of The Aerospace Corporation's Environmental Systems Directorate (ESD) is the IPT's technical manager. G. Loper of The Aerospace Corporation's Lasers and Optical Physics Department, and H. Lundblad coordinated the preparation of this report from material contributed by personnel participating in the launch cloud dispersion measurements during the #K23 mission.

Visible and infrared imagery measurements were made on the launch cloud by R. Abernathy, G. Harper, B. Kasper, J. Knudtson, and J. Valero of The Aerospace Corporation's Environmental Monitoring and Technology Department (EMTD) and D. Schulthess of Aerospace's Eastern Range Systems Engineering Directorate (ERD) in order to monitor the cloud's growth, stabilization, and trajectory. D. Schulthess coordinated site selection and logistical support with appropriate Range organizations. K. Foster (EMTD) digitized the imagery data for analyses by R. Abernathy. R. Abernathy and R. Heidner (EMTD) prepared the description of the cloud imagery results that comprise an important part of this report.

The aircraft-based and ground-level HCl measurement effort was managed by Capt P. Devane of the 45th Medical Group Bioenvironmental Engineering Services (45 AMDS/SGPB) organization. SRS Associates assisted SMC/MEEM in procuring a plane and pilot from the Florida Institute of Technology for the airborne measurements. The plane was outfitted with a Geomet HCl detector that had been modified and calibrated for airborne sampling by D. Curran of NASA's Toxic Vapor Detection Laboratory (TVDL). A ceramic inlet tube was employed for transporting the air sample to the detector from outside the aircraft. J. Hawkins of SGPB was on-board the aircraft during the sampling measurements to monitor instrument performance. S. Beard of NOAA's Environmental Research Laboratories provided a data logger to TVDL that was used to store the HCl concentrations measured with the aircraft's Geomet detector. G. Start of NOAA provided the raw HCl data to R. Abernathy of Aerospace EMTD, who provided baseline corrections to and plotted the corrected data to correlate the HCl detection with aircraft position relative to the launch pad. R. Abernathy and R. Heidner of EMTD processed and described the airborne HCl measurement data presented here.

The ground-level HCl measurement effort was coordinated by MSgt S. Zeigler of SGPB and D. Schulthess of Aerospace's ERD under the direction of Capt Devane. SGPB and NASA/TVDL personnel deployed and analyzed the HCl dosimeters, respectively. SGPB personnel participating in the effort included: TSgt P. Yocum, Sgt E. Everhart, SSgt Patrick, Sgt Rivera, Amn Voight, and Amn Barker. Capt Devane coordinated risk assessment predictions with 45 SW/SES from the Range Control Center Bioenvironmental Engineering Services console. Capt Devane relayed launch cloud dispersion model predictions to supporting SGPB and TVDL personnel for optimum sensor deployment one hour prior to launch. NASA TVDL personnel who participated in the sampling effort included D. Lueck (TVDL technical contact), T. Hammond, B. Meneghelli, M. Springer, D. Curran, T. Hodge, D. Lemay, C. Fogarty, and R. Barile. This report includes a summary of ground-level HCl measurement results provided by D. Lueck, D. Curran, R. Barile, and B. Meneghelli.

D. Schulthess of Aerospace's ERD and R. Evans of Ensco, Inc.'s Applied Meteorology Unit provided meteorological data determined before and after the launch. These data included measurements of ambient temperature, humidity, and wind speed and direction as a function of time at numerous meteorological towers at various tower elevations as well as rawinsonde and Doppler radar wind profiler data collected at various times. D. Schulthess provided REEDM predicted plume stabilization height and ground-level HCl concentrations for use in this report.

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Executive Summary

This report presents plume imagery and aircraft- and ground-based HCl sampling data that document the development and dispersion of the launch plume at Cape Canaveral Air Station (CCAS) during the mission #K23 launch of a Titan IV vehicle. The report also tabulates meteorological tower, rawinsonde, and Doppler radar data to characterize meteorological conditions during mission #K23.

Personnel from The Aerospace Corporation successfully tracked the trajectory and time evolution of the Titan IV vehicle's exhaust plume for 20 minutes following launch using one infrared and three visible camera systems. An Air Force-contracted light aircraft was equipped with a Geomet total HCl analyzer by personnel from NASA's Toxic Vapor Detection Laboratory (NASA TVDL) and used to monitor HCl concentrations within the plume as a function of time for 100 minutes following launch. Personnel from the 45th Medical Group Bioenvironmental Engineering (45 AMDS/SGPB) and TVDL deployed dosimeters to determine ground-level HCl doses. Rawinsonde data were measured before launch, and meteorological tower data were measured before launch and during dispersion of the launch plume. These data and similar results from future launches will be used with data from tracer gas releases to determine the accuracy of atmospheric dispersion models such as REEDM in predicting toxic hazard corridors at CCAS and Vandenberg Air Force Base. The THCs assess the risk of exposing the public to HCl exhaust from vehicles using solid propellants or to the accidental release of hydrazine fuel or nitrogen-tetroxide propellant vapors during launch operations.

The imagery and aircraft-determined HCl data show that the plume separated into ground-cloud and launch-column segments below and above 2000 meters, respectively, that blew out to sea with northeast and southeast trajectories. The stabilization height of the ground cloud at its center (1640 ± 74 meters), as derived from imagery, does not agree well with the REEDM prediction (788 meters). However, the ground cloud's northeast trajectory agrees well with the rawinsonde-determined wind direction at the ground cloud's stabilization height. Aircraft HCl measurements at altitudes above 2000 meters southeast of the launch pad correlate with imagery of the higher altitude launch column, which did not track the lower altitude ground cloud. The aircraft data indicates that this higher altitude launch column did not contribute to measurable HCl below an altitude of 2000 meters. Representative measurement data obtained with the aircraft indicate large spatial variations of HCl in the ground cloud. A peak HCl concentration of 17 ppm was measured 11.5 minutes after launch.

The prediction of out-to-sea winds prevented the deployment of dosimeters for far-field (8-40 mile range) HCl ground sampling. Dosimeters were deployed within a 5.7 mile radius of CCAS Complex 40 to the north, west, and south. Of the dosimeters deployed, only those placed near the launch platform registered responses. Large HCl responses ($\geq$100 ppm-minute) were obtained for dosimeters placed on four lightning towers, 45 meters northeast, southeast, northwest, and southwest of the launch platform and at an east, southeast position on the perimeter fence 180 meters away. REEDM predicted that a low-level inversion layer would prevent the launch cloud from diffusing back to ground level. Safety access limitations and the difficulty of deploying offshore sensors prevented the ground-level monitoring of HCl along the plume's predicted track at distances >180 meters from the launch platform to verify this prediction. However, aircraft HCl measurements performed 50 minutes after launch indicate that the ground cloud contained only low concentrations (0.1-0.5 ppm) of HCl at altitudes as low as 400 meters at distances of 16 km from the launch pad.

Subsequent documents (Volumes II and III of this report) will provide greater detail for the imagery and aircraft HCl measurements summarized here. Volume II will focus on the imagery and use some of the aircraft HCl sampling data to document the position of the aircraft relative to the imaged plume dimensions and to substantiate that the visible cloud contains the bulk of the detectable HCl. Volume III will detail the aircraft's HCl sampling data in formats useful for comparison to model predictions.

1. Introduction

There is a strong need to collect data that can be used to validate the performance of atmospheric dispersion and chemical kinetic models currently used or under development for predicting the transport and fate of hazardous species that may be released into the atmosphere during Air Force launch vehicle operations. Launch vehicles that employ solid propellant rocket motors release ground clouds into the Eastern Range and Western Range launch areas at Cape Canaveral Air Station (CCAS) and Vandenberg Air Force Base (VAFB), respectively, that contain large amounts of hydrogen chloride (HCl). Large quantities of hazardous hydrazine fuels or the nitrogen tetroxide oxidizer could also be accidentally released at the ranges during propellant transfer operations or due to a launch vehicle explosion.

The Air Force launch range safety organizations of the 45th Space Wing at Patrick Air Force Base (45 SPW/SE) and 30th Space Wing at VAFB (30 SPW/SE) are, respectively, responsible for assuring that Eastern and Western Range launches are carried out only when meteorological conditions are such that personnel in communities nearby CCAS and VAFB cannot be exposed to hazardous levels of HCl, the hydrazine fuels, or N_2O_4/NO_2. Predictions of toxic hazard corridors (THCs) that extend into public areas can lead to costly launch delays. The present use of non-validated models requires the use of conservative launch criteria. The development and validation of accurate atmospheric dispersion models is expected to increase launch opportunities and significantly reduce launch costs. The Titan System Program Office (SMC/ME) of the Air Force's Space and Missile Systems Center has thus established the Atmospheric Dispersion Model Validation Program (MVP). MVP is collecting data to determine the accuracy of current and future atmospheric dispersion and chemical kinetic models in predicting THCs during launches of Titan and other vehicles at CCAS and VAFB.

The MVP effort involves the collection of data during Titan launches at CCAS and VAFB to characterize HCl launch cloud rise, growth, and stabilization as well as launch cloud transport and diffusion. These data, as well as data from tracer gas releases, will in particular be used to determine the capability of the Rocket Exhaust Effluent Diffusion Model (REEDM) for predicting THCs at the launch ranges. REEDM (see Appendix A) is used at CCAS and VAFB to predict the locations of THCs in support of launch operations. It is applied to large heated sources of toxic air emissions such as nominal launches, catastrophic failure fireballs, and inadvertent ignitions of solid rocket motors. It uses launch vehicle and meteorological data to generate ground-level concentration isopleths of HCl, hydrazine fuels, NO_2, and other toxic launch emissions. Launch holds may occur when REEDM toxic concentration predictions exceed adopted exposure standards. REEDM is a unique and complex model based on relatively simple modeling physics. It has a long developmental history with the Air Force and NASA, but has never been fully validated. A recent change in toxic exposure standards adopted by the range safety offices has resulted in longer REEDM THCs and a higher potential for launch holds. As a result, validation of REEDM has been identified as a range safety priority.

The MVP has been organized and is being directed by the MVP Integrated Product Team (IPT). SMC/ME is serving as the IPT leader, while the Aerospace Corporation's Environmental Systems Directorate is the IPT technical manager. The IPT consists of personnel with expertise in atmospheric dispersion modeling, meteorology, and atmospheric concentration field measurements. MVP participants include personnel from 30 and 45 SPW (and their contractors), SMC, The Aerospace Corporation, NASA, and NOAA. Key functions include program planning, field data collection, data review and compilation, range coordination, and model validation (see Appendix B).

This report presents the results of measurements performed at CCAS during the launch of a Titan IV vehicle on 14 May, 1995 (mission #K23). Visual and infrared imagery measurements were made to monitor the growth, stabilization, and trajectory of the launch cloud. Measurements were also made during this launch of ground-level HCl doses at selected locations near the launch pad and representative airborne concentrations of HCl within the launch cloud. The imagery and airborne measurement results are presented in sections 2 and 3, respectively. The ground-level HCl doses measured following launch are presented in section 4. REEDM predicted, based upon meteorological data determined 0.3 hours before launch, that no HCl would reach ground level following cloud stabilization. The REEDM input parameters used to predict cloud stabilization heights and surface concentrations are shown in Appendix C. Meteorological data were measured at a number of CCAS monitoring locations prior to launch and during development and dispersion of the launch cloud. These data are tabulated in Appendix D.

Only a qualitative discussion of the accuracy of the REEDM predictions is possible here due to the limited ground-level HCl dose measurements performed. The imagery data obtained show that, for the meteorological conditions present during the #K23 launch, REEDM underestimated the cloud's stabilization height by a factor of 2. However, the imagery data also shows a plume trajectory that is consistent with recorded wind vectors for the stabilized plume. In addition, the imagery indicates that the portions of the initial launch plume track wind vectors at the various altitudes. The variation of wind direction with altitude results in the separation of the high- and low-altitude plume segments into the southeast and northeast quadrants, respectively, as documented by the aircraft's HCl sampling. The aircraft sampling beneath the ground cloud trajectory documented low-level HCl dispersion to the lowest altitude probed (400 meters) at 16 km and 50 minutes after launch. In contrast, sampling beneath the high-altitude plume segment showed no detectable HCl dispersion to levels below the ground cloud's stabilization height. In summary, these results indicate that the ground cloud is the source of low-altitude HCl, that it reaches stabilization height within a time frame easily monitored by visible or infrared imagery, that the trajectory is consistent with rawinsonde data, and that the stabilization height is substantially higher than predicted by REEDM. Review of the results presented in this and subsequent reports will provide insights for improved sampling strategies for future launches.

2. Imagery of the Titan IV K-23 Ground Cloud

[The material in this section was contributed by Drs. R. N. Abernathy and R. F. Heidner III of the Environmental Monitoring and Technology Department of The Aerospace Corporation's Space and Environment Technology Center.]

2.1 Background

On 14 May 1995, the Titan IV K-23 mission was successfully launched from CCAS at 09:45 EDT (13:45 ZULU). This section describes the exhaust cloud imagery data collected by each of three imager sites during the 20 minutes immediately following the launch. It also briefly describes the data acquisition hardware and analysis software. The two-dimensional plume images recorded at each site are combined in a pairwise fashion to produce stereoscopic 3-D information. This analysis yields the plume rise time, stabilization height, dimensions, and ground track.

This section provides an overview of the data collected by the imagery sites. A subsequent report will provide correlation between visible imagery and aircraft HCl measurement data for the first twenty minutes after launch. The latter report will be of particular interest to modelers since it will correlate exhaust cloud imagery with aircraft HCl measurements, rawinsonde measurements, and REEDM predictions.

The raw visible imagery data are archived on VCR tapes. The selected visible images analyzed for this report and all of the infrared imagery are also archived on magneto-optical disks as digital image files.

2.2 Introduction

The Aerospace Corporation imaged the rise, transport, and growth of the ground cloud for the first 20 minutes subsequent to the Titan IV K-23 launch as documented in this Chapter. Analysis of the imagery yields the stabilization time, the stabilization height, and the trajectory of the ground cloud without recourse to additional data sources. Rudimentary knowledge of the rawinsonde wind data and the aircraft HCl sampling data are needed for more quantitative interpretation of the imagery data reported in this Section. As described in detail in Section 3, a modified commercial total HCl (gaseous and aerosol) monitor (Geomet) was mounted in the nose of a Piper Seminole aircraft and measured HCl concentrations in the exhaust cloud for the first 100 min after the Titan IV K-23 launch. A data system logged GPS time and position as well as Geomet response every 0.25 seconds during the flight. The Aerospace Corporation obtained a copy of the aircraft's data as a comma-separated-variable (csv) file, analyzed the HCl data, and provided the interpretation documented in Section 3 and referenced in this Section. The rawinsonde pre-launch meteorology data are documented in Appendix D and referenced in this Section. The REEDM predictions are documented in Appendix C and referenced in this Section.

2.3 Field Deployment

2.3.1 Planning

The Aerospace Corporation's participants are listed in various subteams below. Members of the imaging teams for K-23 are indicated with asterisks.

Technology Operations
Space and Environment Technology Center
Environmental Monitoring and Technology Department

R. N Abernathy*	G. N. Harper*
R. F. Heidner III	B. P. Kasper*
J. T. Knudtson*	J. T. Valero*

Space Launch Operations
Systems Engineering Directorate
Environmental Systems
N. F. Dowling, Systems Director
H. L. Lundblad
Eastern Range
Systems Engineering Directorate
D. R. Schulthess*

2.3.2 Equipment

The equipment at each site included all the hardware and software necessary to record and document the launch, to communicate between sites, and to supply backup power in case of an outage at the fixed power distribution points. The launch of K-23 marked the first opportunity to deploy the Titan IV-dedicated Visible and Infrared Imaging System (VIRIS) hardware.

The VIRIS consists of an array of four plume tracking systems and was designed and fabricated at the request of Space Launch Operations, Systems Engineering Directorate, at The Aerospace Corporation. Each tracking system consists of coaligned visible and infrared (IR) (8–12 μm) imagers, mounted on an azimuth- and elevation-encoding tripod, with an associated data acquisition and display console. The combination of visible and IR imagers permits cloud tracking in both daylight and darkness. The unique capabilities built into the VCR hardware include digital insertion of imager azimuth (Az), elevation (El), time, and GPS location. The system electronics are integrated in a single package, which has been ruggedized for field use. Prewiring of this package makes deployment of these imager systems straightforward, usually requiring less than 45 min for instrumentation at a site to become fully operational.

For the Titan IV K-23 mission, the operator at the UCS-7 site set the FOV of the IR imager to its maximum (i.e., $20_v° \times 40_h°$) using its standard lens. The apertures on the lens of the visible imagers at all sites were set at their widest value ($24_v° \times 32_h°$) to allow for the best comparison of the visible and IR imagery.

All three imaging systems deployed for the Titan IV K-23 mission were capable of total autonomy. Differential-ready GPS receivers documented each imager's position with moderate spatial resolution. Typically, 35 m is the precision in the horizontal plane. Gasoline powered AC generators (Honda Ex1000) are insurance against loss of fixed power. The Stirling cooler option for the AGEMA 900 series IR imagers was chosen so that liquid nitrogen would not be required at the sites. Each unit was transported in a standard utility wagon (e.g., Ford Explorer).

The Az/El angle encoder for all imager systems was calibrated using reference objects (e.g., SLC-40 or lightning towers at SLC-40) within the field of view of the imagers. When reference objects are not part of the geodetic survey database, the GPS location uncertainty is the dominant term in the positional accuracy. Imager pixelation and operator error in edge detection contribute as well to the error in defining the plume boundary. Step-size in the tripod angle encoders is a third source of error. Typically the VIRIS system provides 0.1 degree precision. The accuracy is usually determined by the availability of optimal references for Az/El calibration.

2.4 Processing of Imagery Data

The processing of the imagery data requires several transformations that are performed upon return to The Aerospace Corporation:

1. Digitizing frames of the visible imagery.
2. Measuring the pixel locations of the reference sites within each image (i.e., FOV and angular calibration).
3. Measuring the pixel locations of plume features in digitized images.
4. Converting pixel locations to azimuth and elevation readings.
5. Calculating plume characteristics (i.e., position in Cartesian coordinates relative to the launch pad).

The processing requires the use of specialized hardware and software. Images of the plume are digitized at precise times, beginning with time intervals of 15 s, then 30 s, then 1 min as the plume evolves. Time, Az, and El are tabulated for each digitized image. Triads of digitized images exist for selected times following the launch. A setup file is created for each of these triads, containing all relevant information necessary to compute the plume geometry. The Aerospace program **PLMTRACK** is run to digitize the x, y, and z coordinates of plume features.

PLMTRACK is a software program developed in the Environmental Monitoring and Technology Department (EMTD) of The Aerospace Corporation by Brian P. Kasper. It is designed to analyze pairs of plume images synchronized in time. The operator selects the location of a particular plume feature in the images from the two imager sites by moving a screen pointer over the desired point in each image and clicking a mouse button. **PLMTRACK** then calculates the three-dimensional location of this point and writes the information to a data file.

Another implementation of **PLMTRACK** is the "box method," illustrated in Figure 2.1. The operator draws a rectangle about a plume feature in the images from the two imager sites by moving a screen pointer to the extreme corners of the rectangles and clicking a mouse button. **PLMTRACK** then calculates the closest approach for various rays as illustrated in Figure 2.1 and described below. The top of the plume is defined by rays determining T1 and T2 (i.e., T1 × T2); the bottom is determined by rays

defining B1 and B2 (i.e., B1 × B2); and the middle is defined by the geometric mean of top and bottom (i.e., M1 × M2). To define the "sides" of the rectangles, the points of closest approach for ray M1 with L2 and R2 (the left and right tangents to the plume from Imager 2) are defined (i.e., M1 × L2 and M1 × R2). A similar procedure is used to define the points of closest approach for M2 with L1 and R1, yielding M2 x R1 and M2 × L1. Thus, seven points are defined for the "box" surrounding the plume (a point in the center of each of the six sides, plus a middle point) and are written to a file.

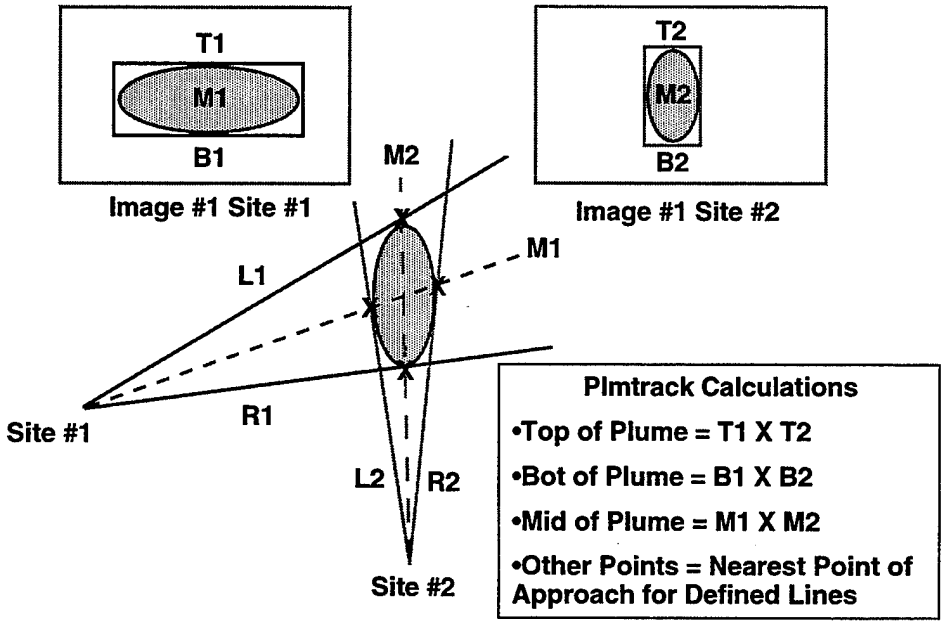


Figure 2.1. Implementation of the "box" method with two imagers.

When three imagers are viewing the plume simultaneously, a six-sided polygon method (documented in Figure 2.2) has been employed as an initial step in our plan to determine plume volume as a function of time. With three imagers, there is a triply redundant determination of the top, middle, and bottom of the plume by **PLMTRACK**. The horizontal extent of the plume is determined by defining the rays from each imager that are tangential to the widest part of the plume as seen from that site. Projection of these extreme rays for each imager on the x-y ground plane forms a six-sided polygon that bounds all material in the plume at all altitudes, as shown in Figure 2.2. Thus, one expects to see aircraft HCl sampling "hits" fall within this polygon, regardless of the sampling altitude. When the polygon area is combined with the mean plume height (i.e., the difference between the top and the bottom) of the plume, one can obtain an upper bound for plume volume. This upper bound volume may *significantly* overestimate the volume of the plume and has not been used in this report. In a separate report, the polygons from imagery are correlated with aircraft HCl measurements of plume dimensions and average HCl concentrations for the Titan IV K-23 launch cloud.

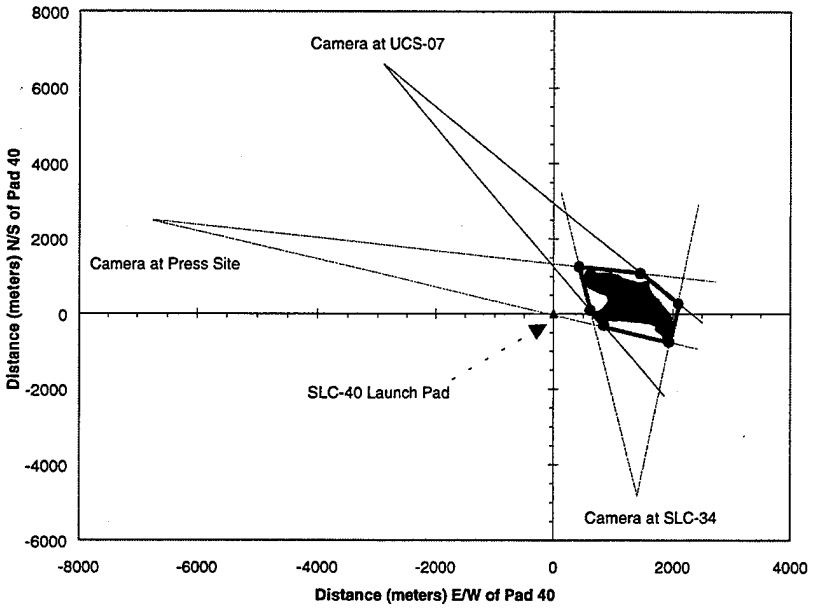


Figure 2.2. Implementation of the six-sided polygon method for three imagers. The imager positions and rays are actual K-23 exhaust cloud imagery results, while the cartoon of the plume was synthesized for heuristic purposes.

2.5 Results and Discussion

2.5.1 Correlation of Ground Cloud Trajectory with Wind Direction

Figure 2.3 reports the trajectory of the visible ground cloud (249° rawinsonde convention [defined fully in subsection 2.5.4]) determined by imagery as well as the rawinsonde derived wind directions associated with the bottom, middle, and top of the stabilized ground cloud (as determined by visible imagery). Figure 2.3 also documents the locations of the rawinsonde release site and of the three imager sites (UCS-7, Press Site, and SLC-34) used by The Aerospace Corporation while imaging the K-23 exhaust cloud.

It is evident from examination of Figure 2.3 that the low-altitude winds (< 2000 meters) were consistent with the imaged movement of the visible ground cloud into the northeast quadrant relative to the SLC-40 launch pad. This observation was confirmed by aircraft measurements of HCl concentration in the northeast quadrant during the first 55 minutes after launch. The aircraft's HCl concentration profiles are consistent with the plume track documented by the imagers for the ground cloud. The T-0.3 hr rawinsonde data in Figure 2.3 are documented in Appendix D.

It is also evident from Figure 2.3 that the wind direction shifted with altitude suggesting that the high-altitude portion of the plume would move towards the southeast while the lower portion of the plume would move towards the northeast. These conclusions were confirmed by the visible imagery that documented that the high-altitude launch column was attached to the southern end (i.e., originally the top) of the ground cloud and that the bottom of the ground cloud rotated to the northeast relative to the top of the ground cloud. The rawinsonde and imagery data are also consistent with aircraft HCl measurements (Section 3) that detected the presence of a high-altitude cloud in the southeast quadrant.

Aircraft sampling beneath this high-altitude cloud found no measurable HCl concentrations at or below the altitude of the stabilized ground cloud at times between 83 to 100 minutes after the launch.

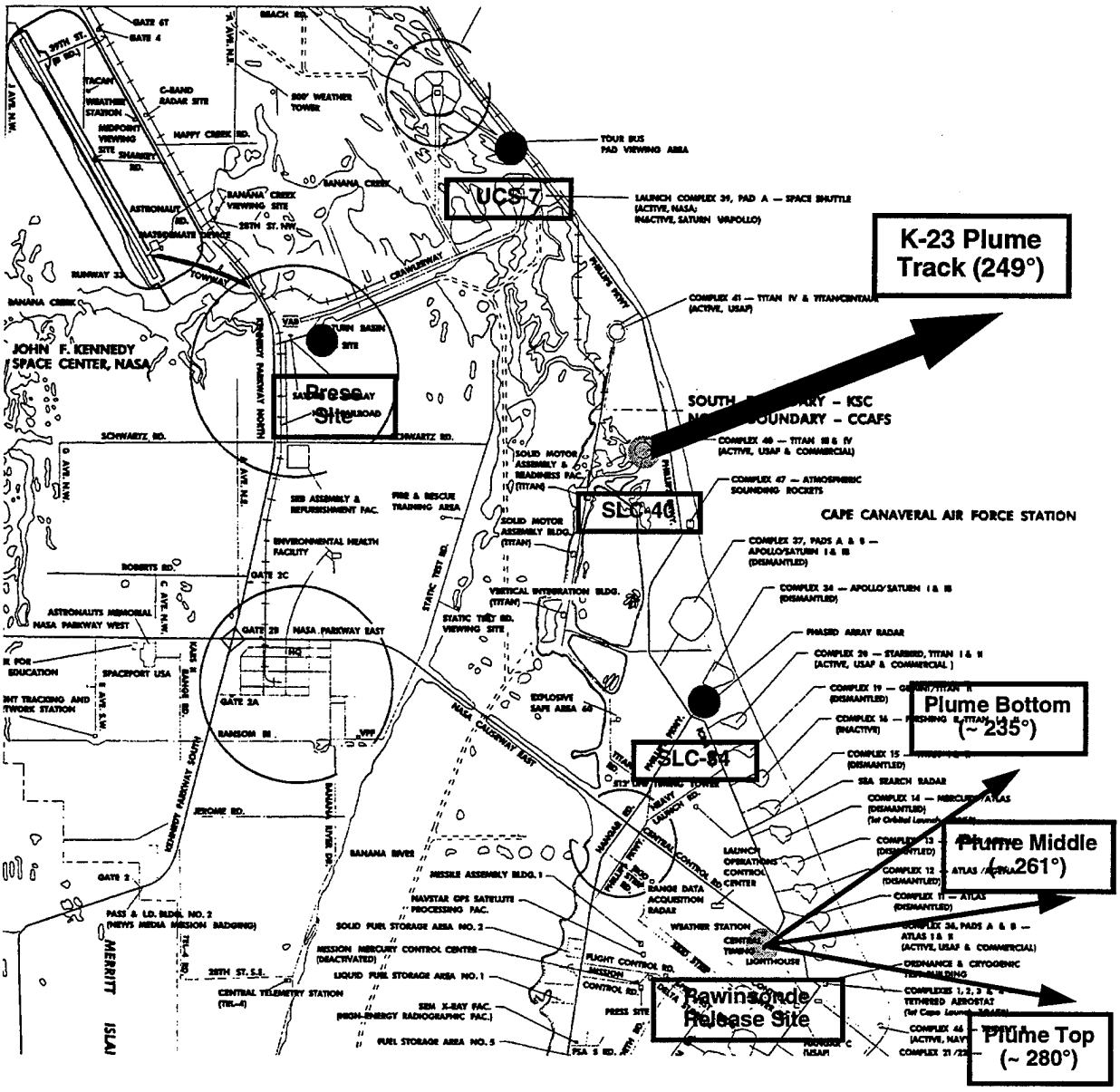


Figure 2.3. A map documenting the imagery sites, the rawinsonde release site, the K-23 ground cloud's track derived from visible imagery, and the 13:27 ZULU (T-0.3 h) rawinsonde wind vectors at the measured plume stabilization heights.

Figures 2.4 through 2.6 are visible images of the Titan IV K-23 launch cloud as seen from each of the three imager sites at the specified times after launch. It is immediately obvious that the plume is not spherically symmetric in any of these images. Figure 2.4 documents imagery from SLC-34, which is south-southeast of the launch pad. Examination of this image reveals that the exhaust duct produces an asymmetry in the ground cloud by ejecting exhaust predominantly to the east (i.e., to the right in Figure 2.4) of the pad. This is consistent with initial aircraft HCl concentration profiles measured due east of

about the mass of the plume that contributes to the stabilized ground cloud. The remainder of the cloud, above and below the arrows in Figure 2.5, dissipates prior to stabilization. For example, the low-altitude residue of such dissipation is barely evident below and to the right of the indicated "bottom of the exhaust duct cloud" in Figure 2.5. In imagery immediately prior to this image, the visible plume extended almost to the inserted text at the bottom of this image. Figure 2.6 documents imagery from Press Site, which is west-northwest of the launch pad. Examination of this image confirms that the bottom of the ground cloud has moved farther to the north (i.e., to the left in Figure 2.6) than the top. During review of a series of images, this appears as clockwise rotation of the bottom of the cloud relative to the top. In addition, Figure 2.6 reveals that there should be detectable HCl above and to the south (i.e., above and to the right in Figure 2.6) of the top of the exhaust cloud. As mentioned previously, this makes the determination of the "top" and "bottom" of the plume somewhat subjective. In some cases, the analyst initially included, at early times, a plume feature that ultimately dissipated by the time the plume had stabilized. Therefore, the data were subjected to an iterative analysis to ensure that only plume features contributing to the stabilized ground cloud (as documented by the entire 20 minutes of imagery) were included in the **PLMTRACK** "boxes."

Figure 2.4. K-23 Launch Viewed from SLC-34 Blockhouse Roof at 00:15 (mm:ss after launch).

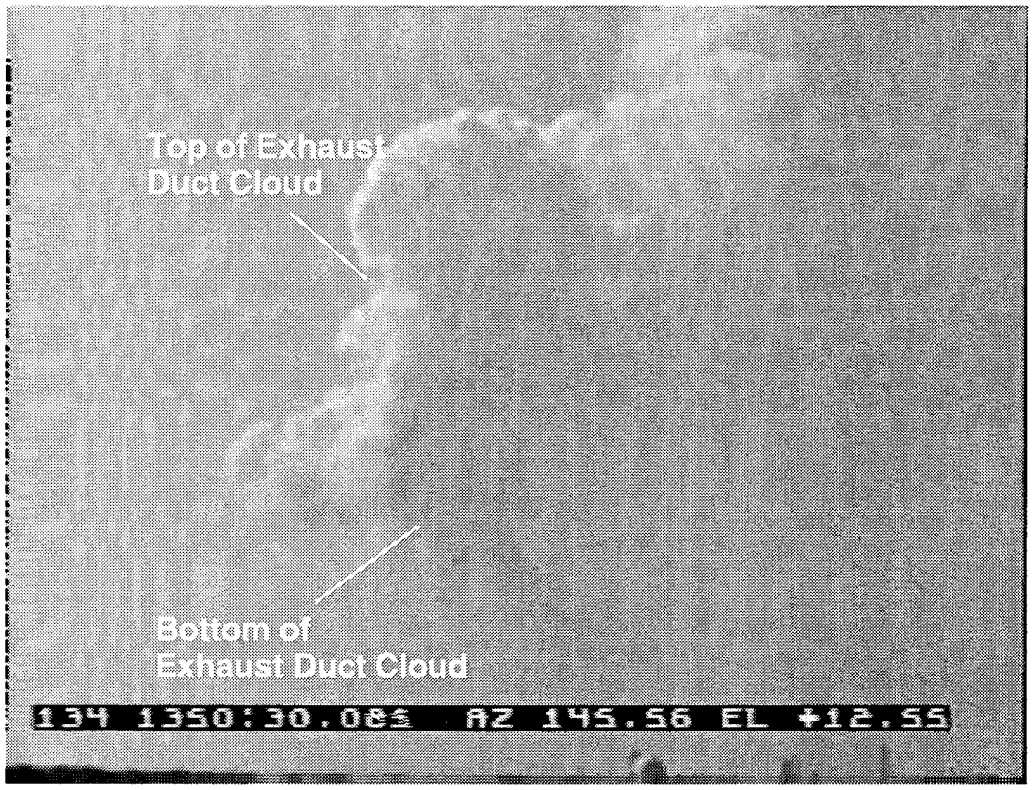


Figure 2.5. K-23 Launch Viewed from UCS-07 Site at 05:30 (mm:ss after launch).

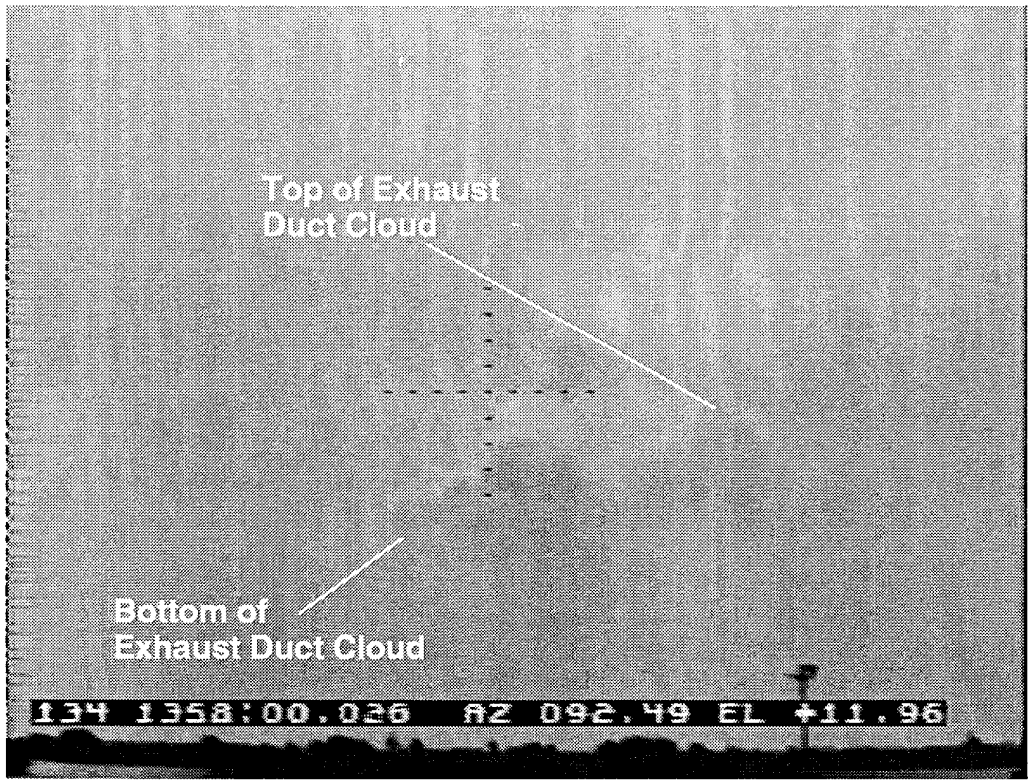
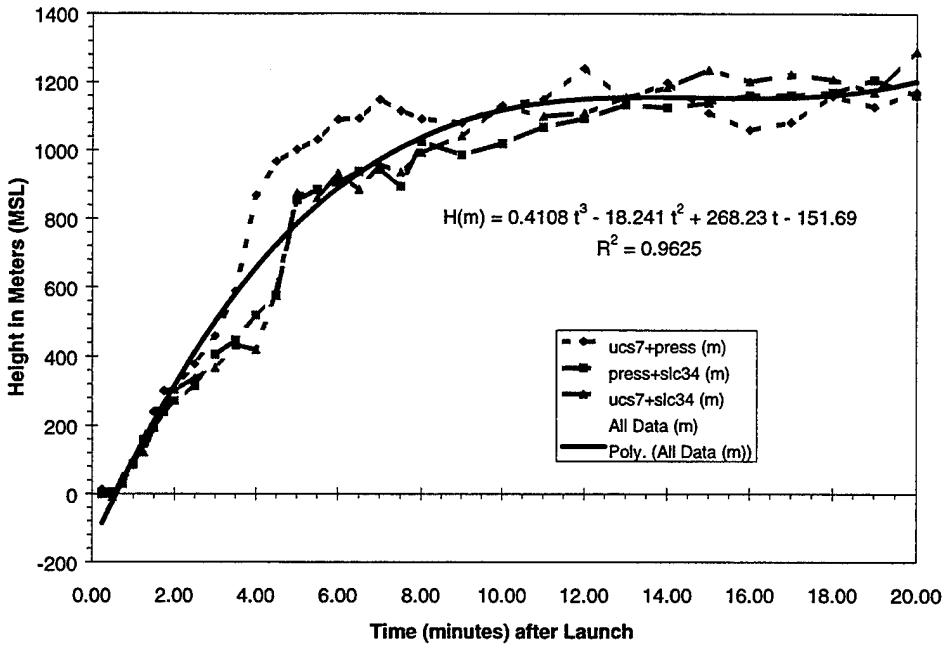


Figure 2.6. K-23 Launch Viewed from Press Site at 13:00 (mm:ss after launch).

2.5.2 Plume Rise Times and Stabilization Heights

A series of plots is presented in Figures 2.7 through 2.9, showing the time-dependent altitude of the "bottom," the "middle," and the "top" of the ground cloud. With three imager locations, it is possible to obtain three independent determinations (3!/2) of these plume heights. The data are presented in two ways. First, the raw data for height vs time after launch are displayed for each of the three determinations (ucs7+press, ucs7+slc34, and slc34+press). The data are presented separately for the bottom (Figure 2.7), the middle (Figure 2.8), and the top (Figure 2.9). A polynomial fit is generated using the combined data from these three determinations [the (a) portion of Figures 2.7 through 2.9]. For clarity, all data (without distinction with respect to imaging site) and the polynomial fit are displayed with horizontal lines illustrating the stabilization height +/– 3σ error levels [the (b) portion of Figures 2.7 through 2.9].



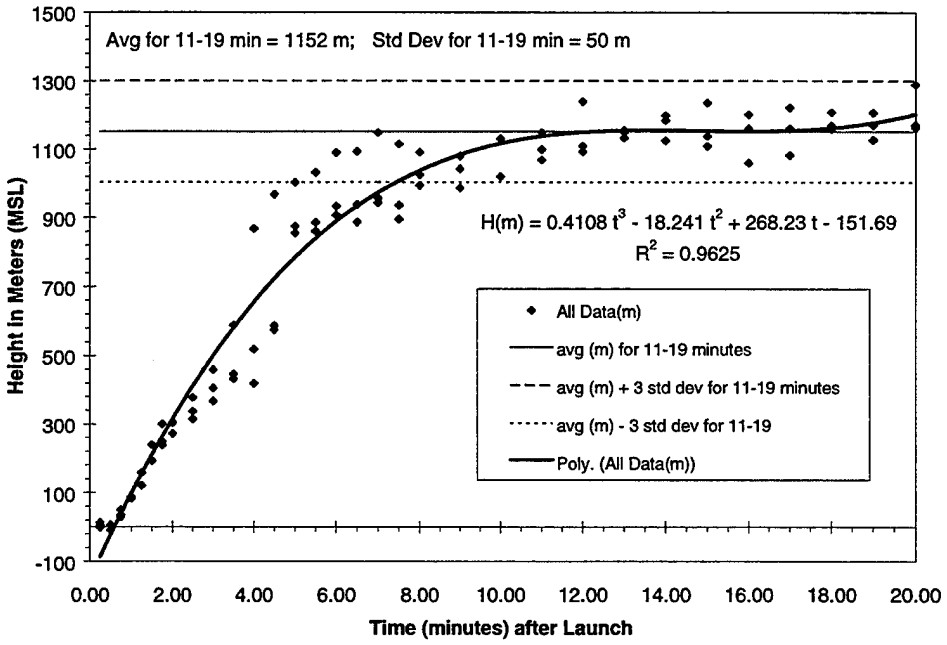
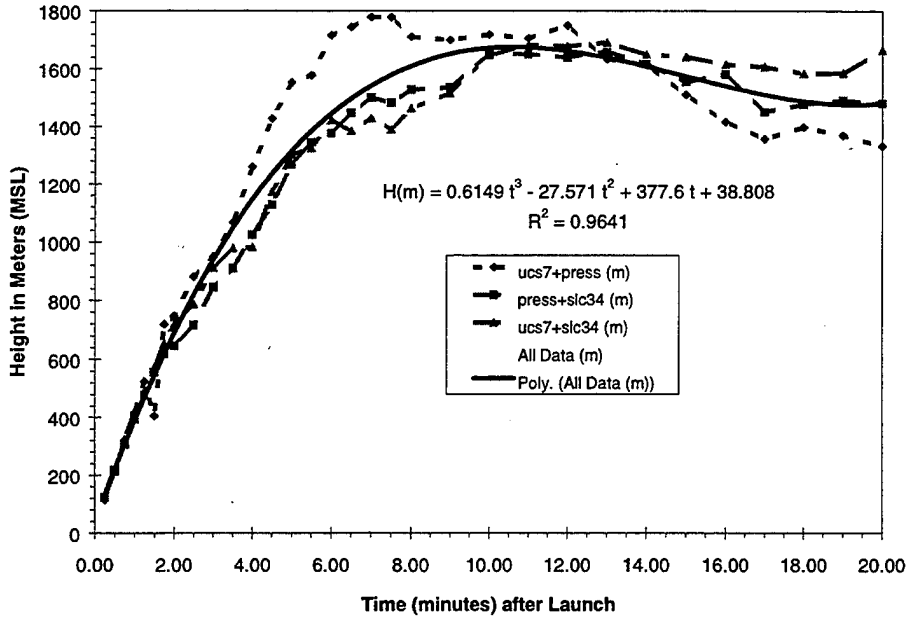


Figure 2.7. Plume rise plot for the bottom of the K-23 plume. (a) Three independent determinations are made from the pairwise combination of data from the three imaging sites. These determinations are labeled as ucs7+press, press+slc34, and ucs7+slc34. The third-order polynomial fit to the entire set of data is plotted as H(t) vs t (in minutes). The variance (R^2) of 0.9625 indicates the high quality of the fit. (b) All three sets of H (t) vs t data are combined and displayed with the third-order polynomial fit and the 3σ error bands for the stabilization height.



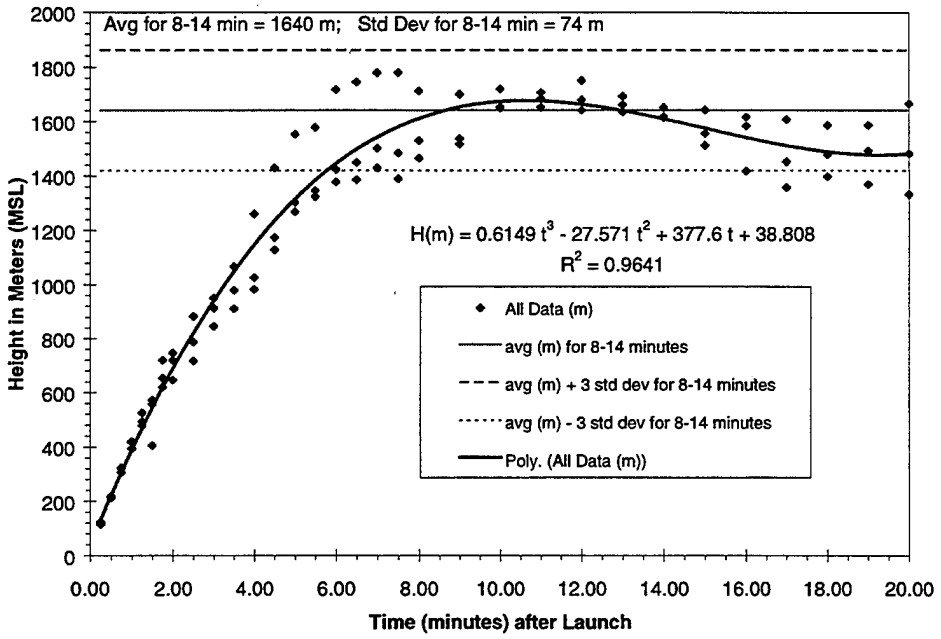
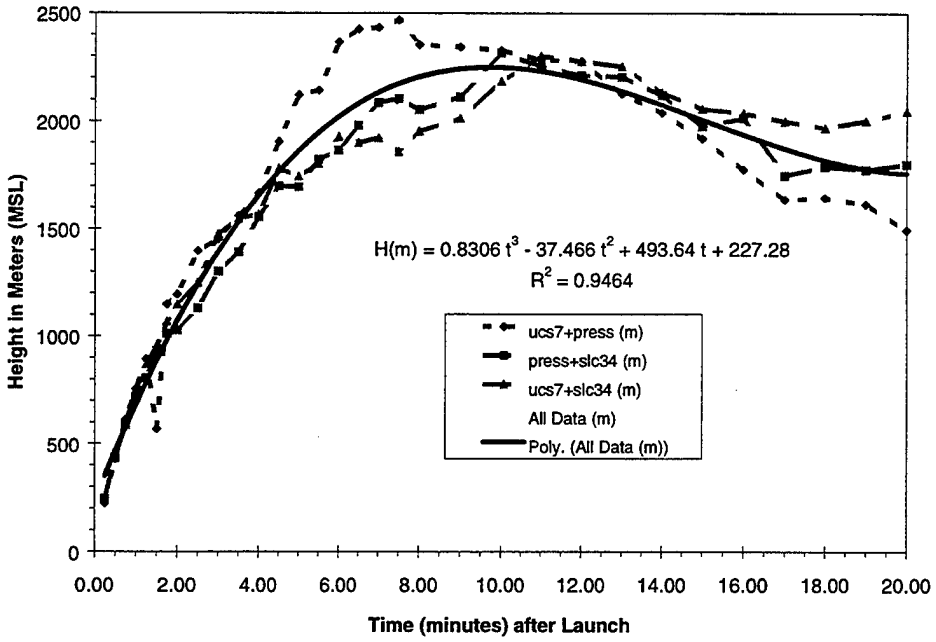


Figure 2.8. Plume rise plot for the middle of the K-23 plume: (a) Three independent determinations are made from the pairwise combination of data from the three imaging sites. These determinations are labeled as ucs7+press, press+slc34, and ucs7+slc34. The third-order polynomial fit to the entire set of data is plotted as H(t) vs t (in minutes). The variance (R^2) of 0.9641 indicates the high quality of the fit. (b) All three sets of H (t) vs t data are combined and displayed with the third-order polynomial fit and the 3σ error bands for the stabilization height.



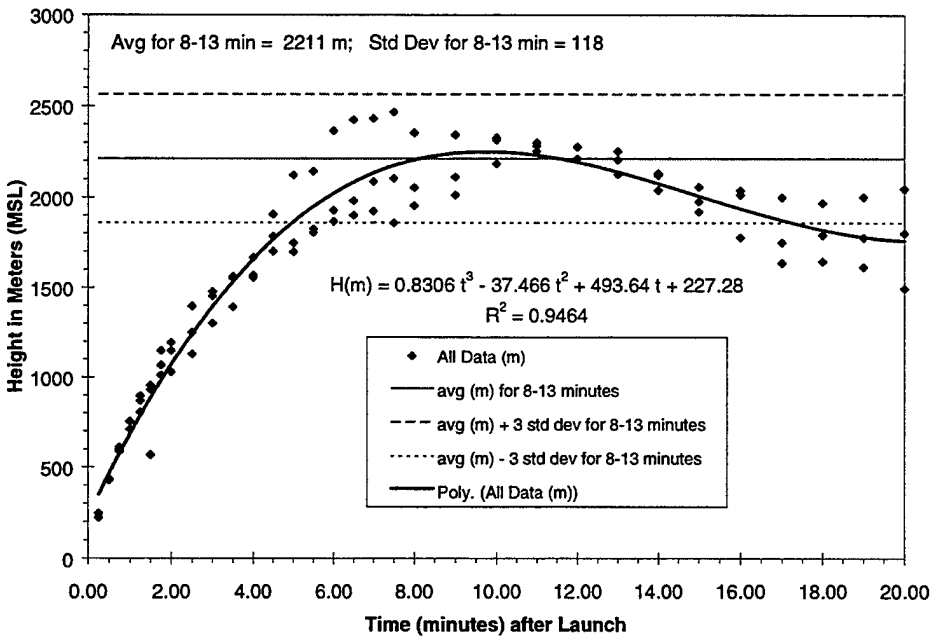


Figure 2.9. Plume rise plot for the top of the K-23 plume: (a) Three independent determinations are made from the pairwise combination of data from the three imaging sites. These determinations are labeled as ucs7+press, press+slc34, and ucs7+slc34. The third-order polynomial fit to the entire set of data is plotted as H(t) vs t (in minutes). The variance (R^2) of 0.9464 indicates the high quality of the fit. (b) All three sets of H (t) vs t data are combined and displayed with the third-order polynomial fit and the 3σ error bands for the stabilization height.

2.5.3 Comparison of REEDM Prediction to Imagery Data

In Figure 2.10, the mean of the three determinations of plume top, plume middle, and plume bottom (rather than the polynomial fits) is plotted as a function of time following the launch. It can be seen that the measured stabilization height of the plume center (1640 +/– 74 m) does not agree well with the calculations generated by REEDM modeling runs (760 +/– 30 m)(Appendix C) performed with pre-launch rawinsonde data (Appendix D). The amount of time required to reach the stabilization height (approximately 11 min) is also in poor agreement with the REEDM predictions (approximately 4.5–5.5 min). The variances (R^2) of the third-order polynomial fits to the data (i.e., Figures 2.7 through 2.9) indicate the fits are very good. A third-order fit was used in those figures as a convenient method to permit the representation of plume overshoot and subsequent damped oscillation around the stabilization height. To be consistent with REEDM, stabilization time and height refer to the first maximum in these fits. REEDM predicts that the plume goes through damped oscillatory motion with a period of $2\pi/S^{1/2}$, where S is the static stability parameter [Ref. 1, Eq. (7)][1]. Examination of Figures 2.8 and 2.9 shows that

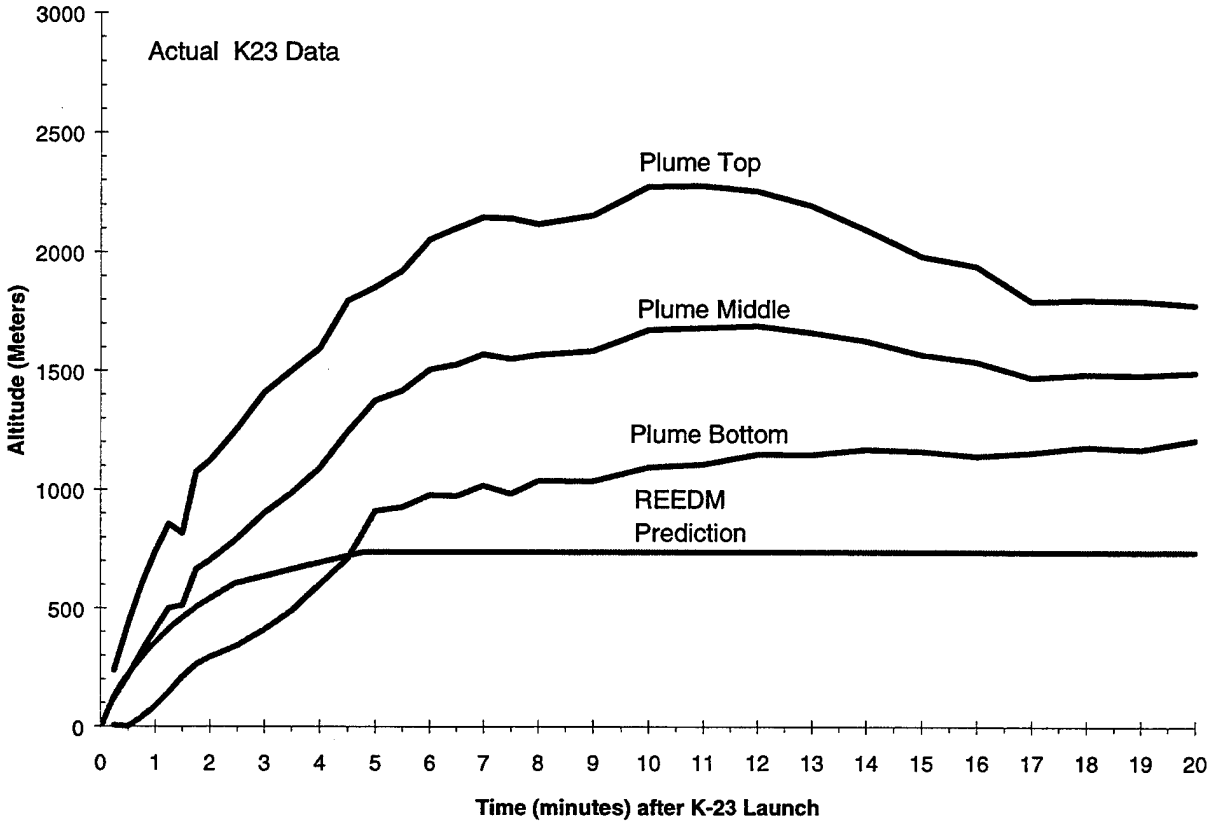


Figure 2.10. The mean of the data (not the third-order polynomial fit) for the three independent determinations for top, middle, and bottom of the ground cloud (Figures 2.7 through 2.9) are plotted as H(t) vs t. REEDM modeling run predictions for the plume middle are presented for comparison.

[1] J. R. Bjorklund, User's Manual for the REEDM Version 7 (Rocket Exhaust Effluent Diffusion Model) Computer Program, Vol. I, TR-90-157-01, AF Systems Command, Patrick AFB, FL (April 1990).

period is approximately 15 min for the K-23 ground cloud. Sensitivity of REEDM predictions to input parameters has been examined by Womack.[2] Careful imaging of launch ground clouds under a variety of meteorological conditions is a vital element in REEDM evaluation.

2.5.4 Plume Trajectory

Figure 2.11 presents data for the ground track of the K-23 ground cloud. The "box" method of analysis for the imagery data does not yield independent values of the plume track for the top, middle, and bottom of the plume. We have chosen to present data for the middle of the plume as defined by **PLMTRACK**.

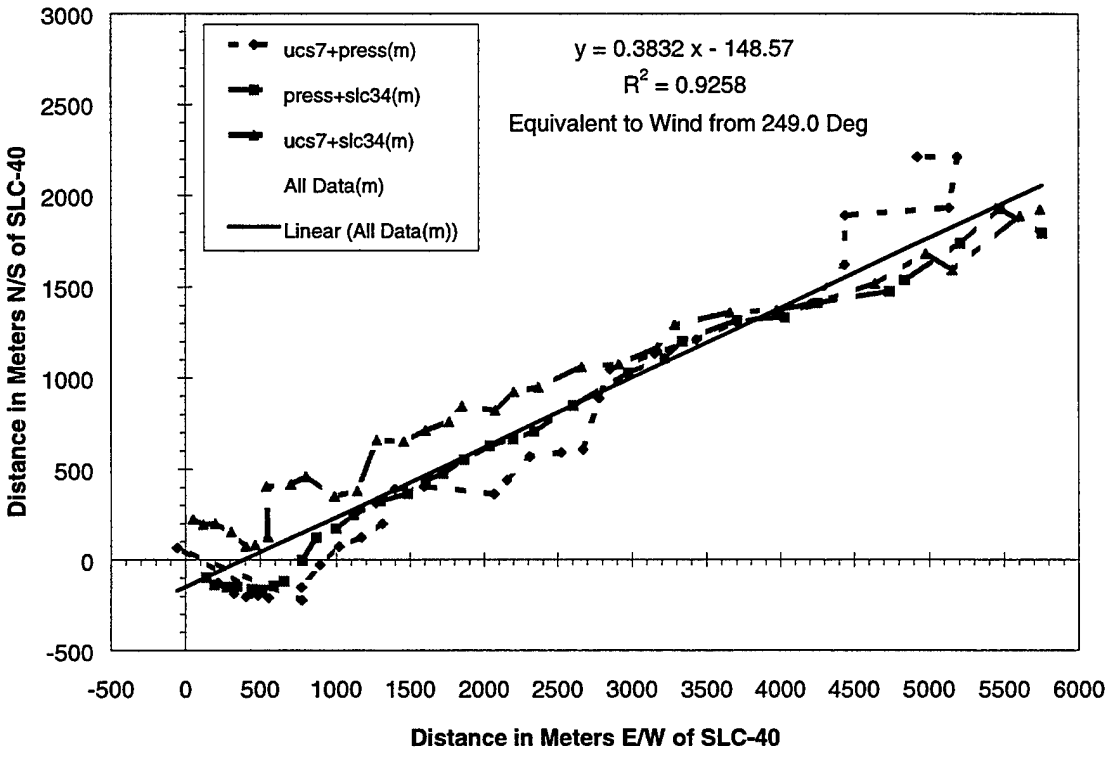


Figure 2.11. Ground track for the middle of the K-23 launch cloud. Three independent determinations are made from the pairwise combination of data from the three imaging sites. These determinations are labeled as ucs7+press, press+slc34, and ucs7+slc34. The variance ($R^2 = 0.9258$) of the linear fit to the combined data from all three sets is reported, yielding a track of 249.0° (rawinsonde convention).

[2] J. M. Womack, *Rocket Exhaust Effluent Diffusion Model Sensitivity Study*, TOR-95(5448)-3, The Aerospace Corporation, El Segundo, CA (May 1995).

To be precise, the ground track in Figure 2.11 represents the ground plane projection of the trajectory of the middle of the plume as a function of time. Figure 2.11 presents data from the three imager-site pairs, as well as an "average" ground track computed as a single linear fit to the combined data sets using the following formula:

$$Y = mX + b \quad , \qquad 2.1$$

where Y is the distance in meters along the north-south axis, m is the slope of the fit, X is the distance in meters along the east-west axis, and b is the intercept for the fit. We have permitted the intercept (b) to be nonzero, since the plume from the duct, coupled to low altitude wind shear, can combine to make the apparent origin of the plume different from the location of the launch complex. That displacement can also be modeled within the REEDM code during plume rise.

In this report, the angles will conform to the convention of rawinsonde wind vectors (the angle from which the wind originates that would push the plume to the sampled position). Thus, the angles are related by

$$\vartheta = 180 + \Phi \quad , \qquad 2.2$$

where ϑ is the equivalent rawinsonde wind angle and Φ is the measured polar angle of the aircraft relative to SLC-40 and clockwise of true north. For example, when the aircraft is due east of SLC-40, Φ is 90° and ϑ is 270°. In Figure 2.11, the slope (m) of the fitted line is determined by the angle θ, where $\theta = \tan^{-1} m$, and therefore $\Phi = 90° - \theta$. Figure 2.3 showed the mean plume track vector documented in Figure 2.11 along with the wind vectors (T-0.3 h rawinsonde) at the measured stabilization heights superimposed on the map of CCAS/KSC.

2.6 Summary and Conclusions

The Titan IV K-23 mission was launched successfully from the Eastern Range (SLC-40) at 9:45 am (13:45Z) on 14 May 1995. Personnel from The Aerospace Corporation deployed three visible and one IR imaging systems to monitor the event and to track the time evolution and the ground trajectory of the solid rocket motor exhaust cloud. The three chosen sites (UCS-7, SLC 34, and the Press Site) were located to the north-northwest, south-southeast, and west-northwest relative to launch complex SLC-40. Imagery data were recorded for 45 min, although the plume was discernible for roughly half that time. When combined with the Az/El readings and the IRIG-B time data, the visible imagery was used to quantify angular movement and growth of the plume for 20 min after the launch. The launch of K-23 marked the first application of the Titan IV-dedicated VIRIS imaging platforms.

The imagery data documented that the meteorological conditions were favorable for characterization of the launch's exhaust cloud using either visible imagers or IR imagers. The definition of exhaust cloud geometric features was complicated by multiple contributions to the complex shape of the evolving cloud (i.e., asymmetric ejection from the exhaust duct, rapid rise of the hot ground cloud, and separation of the high altitude launch column). This was particularly true in trying to define the "bottom" and "top" of the cloud. The analyst included only the portions of the exhaust cloud that became incorporated into the stabilized ground cloud.

Analysis of the imagery data presented in this report has focused on determining parameters that are directly comparable to REEDM predictions. The most accurately determined quantities by imagery are the cloud rise time, its stabilization height, and its trajectory. For Titan IV K-23, REEDM predicted a stabilization height and time that were a factor of 2 lower than the values measured by imagery. The calculated and measured trajectories were in much better agreement.

3. Aircraft Elevated HCl Measurements

[The material in this section was contributed by Drs. R. N. Abernathy and R. F. Heidner III of the Environmental Monitoring and Technology Department of The Aerospace Corporation's Space and Environment Technology Center.]

3.1 Background

On 14 May 1995, the Titan IV K-23 mission was successfully launched from CCAS at 09:45 EDT. This section describes the HCl concentration data collected by an aircraft that sampled the resulting exhaust cloud for 100 minutes subsequent to the launch. This aircraft sampling campaign was overseen by 45SPW and involved Air Force, NASA, NOAA and contractor organizations. The Aerospace Corporation applied baseline corrections to the raw HCl concentration data and produced the plots included in this section. The aircraft's HCl concentration data document the movement of the low-altitude (< 2000 meters) ground cloud to the northeast following the launch, the dispersion of the ground cloud to altitudes as low as 400 meters (50 minutes after the launch and 16 km from the launch pad), and the movement of the elevated (> 2000 meters) launch column to the southeast without measurable dispersion to lower altitudes (i.e., between 1000 to 2000 meters).

The aircraft HCl concentration data are reported here in several graphical formats to facilitate comparison with modeling and with imagery data. This section provides an overview of the data collected by the aircraft. Two subsequent reports will provide (1) correlation between imagery and aircraft data for the first twenty minutes after launch and (2) a detailed graphical analysis of the aircraft's HCl concentration profiles using polar and Cartesian coordinates for each 10 minute time window throughout the 100 minute flight time. These subsequent detailed analysis reports will be of particular interest to modelers since they will correlate HCl measurements with imagery, rawinsonde measurements, and REEDM predictions. The raw aircraft data are available as comma-separated-variable files providing time, latitude, longitude, altitude, and Geomet response.

3.2 Introduction

As described in detail in Section 4, I-NET, a NASA contractor, modified a commercial total HCl (gaseous and aerosol) monitor (Geomet) for mounting in the nose of a Piper (PA-44-180) Seminole, twin-engine, four-seat aircraft. This instrument sampled the air through a horizontal four-foot ceramic inlet wetted with a bromate/bromide-containing reagent. The HCl diffuses to the wetted walls of the ceramic tube and produces bromine vapor through reactions with the reagent. The bromine vapor is swept into a buffered hydrogen peroxide/Luminol solution resulting in photoluminescence detected by a filtered photometric detector. I-NET also disabled the Geomet's autoranging electronics so that a single range produced a millivolt response that was proportional to the combined HCl vapor and aerosol concentration entering the inlet. I-NET calibrated the Geomet before and after the K-23 mission as described in Section 4.

SRS Technologies Inc., a SETA contractor, provided an interface between the I-NET laboratory and the Florida Institute of Technology (FIT) flight crew. NASA, NOAA/Air Resources Laboratory/Field Research Division, I-NET, SRS, and FIT cooperated in the integration of the NOAA data system, the FIT aircraft, and the AF Geomet into an airborne sampling and data logging system. FIT personnel piloted the aircraft during the K-23 mission while 45th AMDS/SGPB personnel operated the NOAA data system and the Geomet detector. The NOAA data system logged GPS time and position as well as Geomet

response every 0.25 seconds during the flight. NOAA provided a comma-separated-variable (csv) raw data file to The Aerospace Corporation.

The Aerospace Corporation imaged the rise, movement, and growth of the ground cloud for the first 20 minutes subsequent to the launch as documented in Section 2. The imagery documented the stabilization height and the trajectory of the ground cloud. Rudimentary knowledge of the rawinsonde wind data (Appendix D), REEDM predictions (Appendix C) and the imagery data (Section 2) is required for the interpretation of the aircraft's HCl sampling data as reported in this Section.

3.3 Results and Discussion

The aircraft data is most easily interpreted in light of some rudimentary rawinsonde and imagery results. Figure 3.1 reproduces a map from Section 2 that reports the trajectory of the visible ground cloud (249° rawinsonde convention [defined fully in subsection 3.3.2]) determined by imagery as well as the rawinsonde derived wind directions associated with the bottom, middle, and top of the visible ground cloud. Figure 3.1 also documents the locations of the three camera sites (UCS-7, Press Site, and SLC-34) used by the Aerospace Corporation while imaging the K-23 mission. As evident from examination of Figure 3.1, the vectors drawn on the map document that the low-altitude winds (< 2000 meters) were consistent with the imaged movement of the visible ground cloud into the northeast quadrant relative to the SLC-40 launch pad. The T-0.3 hr rawinsonde data are documented in Appendix D. It is also evident from Figure 3.1 that the wind direction shifted with altitude suggesting that the high-altitude portion of the plume would move towards the southeast while the lower portion of the plume would move towards the northeast. This was confirmed by the visible imagery that documented that the high-altitude launch column was attached to the southern end of the ground cloud, and that the bottom of the ground cloud rotated to the north of the top of the ground cloud.

3.3.1 Overview of Aircraft Sampling

Table 3.1 presents a sample of the aircraft data delivered to The Aerospace Corporation with added headings. The headings are as follows: Log (mission log number assigned by NOAA); yr (year); d (Julian day of the year); hm (hour and minutes, two digits each); s (seconds); ppm (raw HCl concentration based upon single point calibration and mV response from the Geomet); rng (range of the Geomet, disabled function); mV (Geomet response in millivolts); gps (GPS receiver time in hhmmss [documenting hours minutes seconds as six digits without separation]); lat (latitude, ddmm.mmmm, in degrees and decimal minutes); N/S (label for latitude, North/South); lon (longitude, ddmm.mmmm, in degrees and decimal minutes); E/W (label for longitude, East/West); diff (differential, 2, or normal, 1, GPS mode); # Sat (number of GPS Satellites); HDOP (horizontal dilution of precision [measure of GPS accuracy]); alt (altitude reported from GPS receiver); and units (M, meters for alt). Personnel from The Aerospace Corporation have reviewed these data in 10 minute increments and applied baseline corrections to eliminate apparently negative HCl concentrations. Personnel from The Aerospace Corporation have also performed the conversions necessary to report distance, polar angles, and Cartesian position in meters relative to SLC-40.

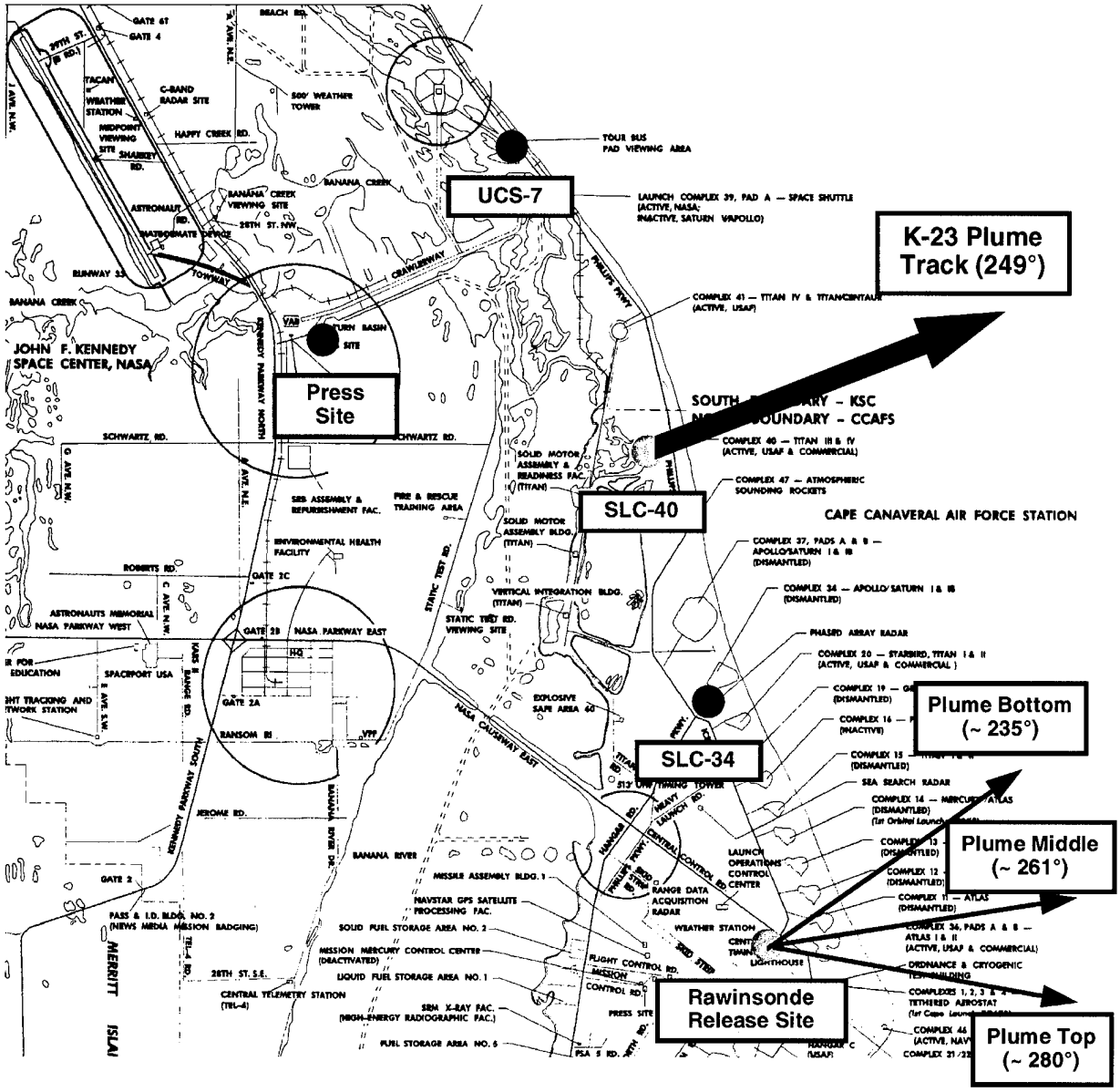


Figure 3.1. Map Documenting camera sites, rawinsonde release point, imagery derived plume track, and rawinsonde derived wind vectors for the Titan IV K-23 mission.

Table 3.1. Portion of the Aircraft's Data File Provided to The Aerospace Corporation by NOAA. This data includes the first aircraft pass through the Titan IV K-23 exhaust cloud.

Log	yr	d	hm	s	ppm	mg	mV	gps	lat	N/S	lon	E/W	diff	# Sat	HDOP	alt	units
113	1995	134	1349	20.75	-0.040	1996	-0.997	134922	2833.7618	N	8034.0065	W	1	8	0.9	662	M
113	1995	134	1349	21	0.040	1996	0.997	134922	2833.7618	N	8034.0065	W	1	8	0.9	662	M
113	1995	134	1349	21.25	0.385	1996	9.630	134923	2833.7577	N	8033.9744	W	1	8	0.9	663	M
113	1995	134	1349	21.5	0.518	1996	12.960	134923	2833.7577	N	8033.9744	W	1	8	0.9	663	M
113	1995	134	1349	21.75	0.930	1996	23.250	134923	2833.7577	N	8033.9744	W	1	8	0.9	663	M
113	1995	134	1349	22	1.302	1996	32.550	134923	2833.7577	N	8033.9744	W	1	8	0.9	663	M
113	1995	134	1349	22.25	1.714	1996	42.850	134924	2833.7533	N	8033.9421	W	1	8	0.9	663	M
113	1995	134	1349	22.5	2.365	1996	59.130	134924	2833.7533	N	8033.9421	W	1	8	0.9	663	M
113	1995	134	1349	22.75	2.378	1996	59.460	134924	2833.7533	N	8033.9421	W	1	8	0.9	663	M
113	1995	134	1349	23	2.352	1996	58.800	134924	2833.7533	N	8033.9421	W	1	8	0.9	663	M
113	1995	134	1349	23.25	2.166	1996	54.150	134925	2833.7493	N	8033.9093	W	1	8	0.9	663	M
113	1995	134	1349	23.5	2.564	1996	64.110	134925	2833.7493	N	8033.9093	W	1	8	0.9	663	M
113	1995	134	1349	23.75	2.458	1996	61.450	134925	2833.7493	N	8033.9093	W	1	8	0.9	663	M
113	1995	134	1349	24	1.913	1996	47.830	134925	2833.7493	N	8033.9093	W	1	8	0.9	663	M
113	1995	134	1349	24.25	1.408	1996	35.210	134926	2833.7455	N	8033.8764	W	1	8	0.9	663	M
113	1995	134	1349	24.5	1.741	1996	43.520	134926	2833.7455	N	8033.8764	W	1	8	0.9	663	M
113	1995	134	1349	24.75	4.491	1996	112.300	134926	2833.7455	N	8033.8764	W	1	8	0.9	663	M
113	1995	134	1349	25	6.165	1997	154.100	134926	2833.7455	N	8033.8764	W	1	8	0.9	663	M
113	1995	134	1349	25.25	5.873	1997	146.800	134927	2833.7417	N	8033.8431	W	1	8	0.9	663	M
113	1995	134	1349	25.5	6.086	1997	152.100	134927	2833.7417	N	8033.8431	W	1	8	0.9	663	M
113	1995	134	1349	25.75	5.421	1996	135.500	134927	2833.7417	N	8033.8431	W	1	8	0.9	663	M
113	1995	134	1349	26	5.953	1997	148.800	134927	2833.7417	N	8033.8431	W	1	8	0.9	663	M
113	1995	134	1349	26.25	7.610	1997	190.300	134928	2833.7379	N	8033.8097	W	1	8	0.9	662	M
113	1995	134	1349	26.5	7.670	1997	191.700	134928	2833.7379	N	8033.8097	W	1	8	0.9	662	M
113	1995	134	1349	26.75	5.727	1997	143.200	134928	2833.7379	N	8033.8097	W	1	8	0.9	662	M
113	1995	134	1349	27	6.338	1997	158.500	134928	2833.7379	N	8033.8097	W	1	8	0.9	662	M
113	1995	134	1349	27.25	5.660	1996	141.500	134929	2833.7338	N	8033.7762	W	1	8	0.9	661	M
113	1995	134	1349	27.5	6.205	1997	155.100	134929	2833.7338	N	8033.7762	W	1	8	0.9	661	M
113	1995	134	1349	27.75	7.110	1997	177.700	134929	2833.7338	N	8033.7762	W	1	8	0.9	661	M
113	1995	134	1349	28	7.590	1997	189.700	134929	2833.7338	N	8033.7762	W	1	8	0.9	661	M
113	1995	134	1349	28.25	5.753	1997	143.800	134930	2833.7294	N	8033.7424	W	1	8	0.9	660	M
113	1995	134	1349	28.5	3.402	1996	85.000	134930	2833.7294	N	8033.7424	W	1	8	0.9	660	M
113	1995	134	1349	28.75	3.282	1996	82.000	134930	2833.7294	N	8033.7424	W	1	8	0.9	660	M
Log	yr	d	hm	s	ppm	mg	mV	gps	lat	N/S	lon	E/W	diff	# Sat	HDOP	alt	units
113	1995	134	1349	29	2.099	1996	52.490	134930	2833.7294	N	8033.7424	W	1	8	0.9	660	M
113	1995	134	1349	29.25	1.448	1996	36.210	134931	2833.7249	N	8033.7083	W	1	8	0.9	658	M
113	1995	134	1349	29.5	1.103	1996	27.570	134931	2833.7249	N	8033.7083	W	1	8	0.9	658	M
113	1995	134	1349	29.75	1.236	1996	30.890	134931	2833.7249	N	8033.7083	W	1	8	0.9	658	M
113	1995	134	1349	30	1.355	1996	33.880	134931	2833.7249	N	8033.7083	W	1	8	0.9	658	M
113	1995	134	1349	30.25	1.143	1996	28.570	134932	2833.7204	N	8033.6737	W	1	8	0.9	656	M
113	1995	134	1349	30.5	0.917	1996	22.920	134932	2833.7204	N	8033.6737	W	1	8	0.9	656	M
113	1995	134	1349	30.75	0.757	1996	18.930	134932	2833.7204	N	8033.6737	W	1	8	0.9	656	M
113	1995	134	1349	31	0.611	1996	15.280	134932	2833.7204	N	8033.6737	W	1	8	0.9	656	M

113	1995	134	1349	31.25	0.478	1996	11.960	134933	2833.7161	N	8033.6387	W	1	8	0.9	654	M
113	1995	134	1349	31.5	0.452	1996	11.290	134933	2833.7161	N	8033.6387	W	1	8	0.9	654	M
113	1995	134	1349	31.75	0.399	1996	9.970	134933	2833.7161	N	8033.6387	W	1	8	0.9	654	M
113	1995	134	1349	32	0.345	1996	8.640	134933	2833.7161	N	8033.6387	W	1	8	0.9	654	M
113	1995	134	1349	32.25	0.372	1996	9.300	134934	2833.7122	N	8033.6033	W	1	8	0.9	652	M
113	1995	134	1349	32.5	0.345	1996	8.640	134934	2833.7122	N	8033.6033	W	1	8	0.9	652	M
113	1995	134	1349	32.75	0.292	1996	7.310	134934	2833.7122	N	8033.6033	W	1	8	0.9	652	M
113	1995	134	1349	33	0.252	1996	6.312	134934	2833.7122	N	8033.6033	W	1	8	0.9	652	M
113	1995	134	1349	33.25	0.239	1996	5.979	134935	2833.7089	N	8033.5675	W	1	8	0.9	651	M
113	1995	134	1349	33.5	0.213	1996	5.315	134935	2833.7089	N	8033.5675	W	1	8	0.9	651	M
113	1995	134	1349	33.75	0.186	1996	4.651	134935	2833.7089	N	8033.5675	W	1	8	0.9	651	M
113	1995	134	1349	34	0.186	1996	4.651	134935	2833.7089	N	8033.5675	W	1	8	0.9	651	M
113	1995	134	1349	34.25	0.159	1996	3.986	134936	2833.7067	N	8033.5314	W	1	8	0.9	650	M
113	1995	134	1349	34.5	0.133	1996	3.322	134936	2833.7067	N	8033.5314	W	1	8	0.9	650	M
113	1995	134	1349	34.75	0.133	1996	3.322	134936	2833.7067	N	8033.5314	W	1	8	0.9	650	M
113	1995	134	1349	35	0.106	1996	2.657	134936	2833.7067	N	8033.5314	W	1	8	0.9	650	M
113	1995	134	1349	35.25	0.106	1996	2.657	134937	2833.7059	N	8033.4951	W	1	8	0.9	649	M
113	1995	134	1349	35.5	0.106	1996	2.657	134937	2833.7059	N	8033.4951	W	1	8	0.9	649	M
113	1995	134	1349	35.75	0.080	1996	1.993	134937	2833.7059	N	8033.4951	W	1	8	0.9	649	M
113	1995	134	1349	36	0.080	1996	1.993	134937	2833.7059	N	8033.4951	W	1	8	0.9	649	M
113	1995	134	1349	36.25	0.080	1996	1.993	134938	2833.7067	N	8033.4585	W	1	8	0.9	648	M
113	1995	134	1349	36.5	0.080	1996	1.993	134938	2833.7067	N	8033.4585	W	1	8	0.9	648	M
113	1995	134	1349	36.75	0.080	1996	1.993	134938	2833.7067	N	8033.4585	W	1	8	0.9	648	M
113	1995	134	1349	37	0.080	1996	1.993	134938	2833.7067	N	8033.4585	W	1	8	0.9	648	M
113	1995	134	1349	37.25	0.080	1996	1.993	134939	2833.7092	N	8033.4220	W	1	8	0.9	648	M
113	1995	134	1349	37.5	0.080	1996	1.993	134939	2833.7092	N	8033.4220	W	1	8	0.9	648	M
113	1995	134	1349	37.75	0.080	1996	1.993	134939	2833.7092	N	8033.4220	W	1	8	0.9	648	M
113	1995	134	1349	38	0.066	1996	1.661	134939	2833.7092	N	8033.4220	W	1	8	0.9	648	M

Figure 3.2 plots the spatial extent of aircraft sampling in the 100 minutes following the launch of K-23. It represents conversion of the latitude and longitude of the aircraft position to Cartesian coordinates centered on the SLC-40 launch complex. The aircraft position is labeled with HCl concentration data. The HCl concentrations are based on the Geomet instrument calibration performed by the NASA Toxic Vapor Detection/Contamination Monitoring Laboratory and subsequent baseline correction by The Aerospace Corporation. As shown in Figure 3.2, the aircraft flight pattern was largely confined to a 15 km x 15 km square occupying the northeast and southeast quadrants relative to the launch complex. Time (0–100 minutes), polar angle (0 to 360 degrees in the rawinsonde convention), distance (0–18000 meters), and altitude (0–3700m) are variables in the flight tracks presented in Figures 3.3 through 3.5. Thus, the HCl concentration hits noted in Figure 3.2 can be interpreted in light of these other critical variables.

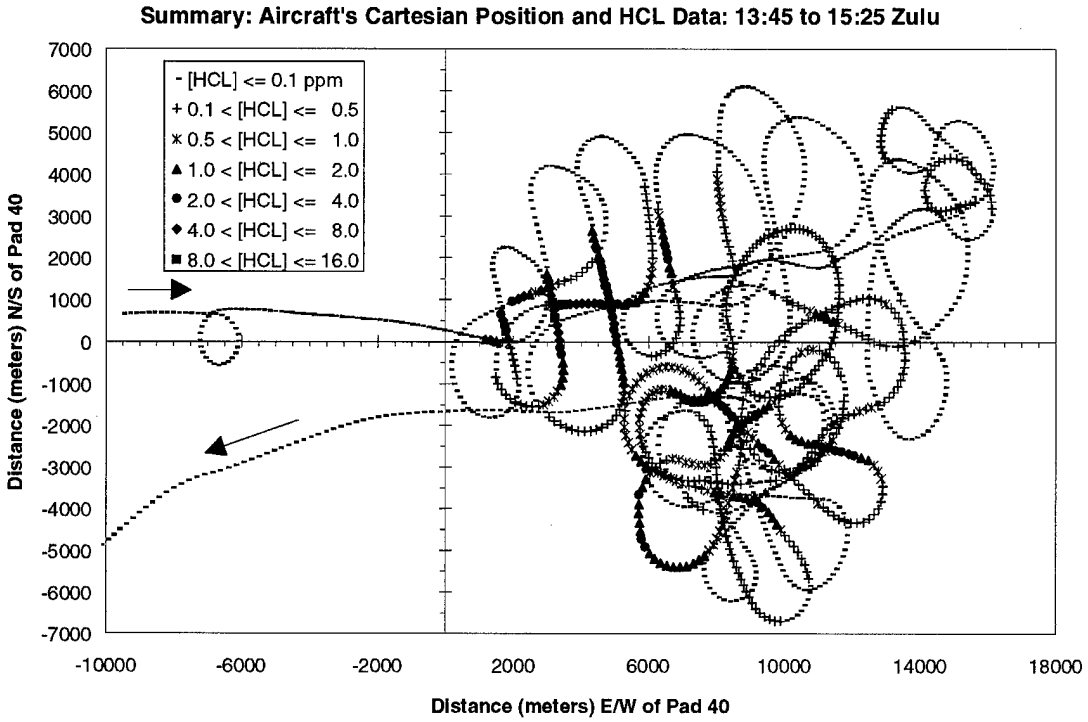


Figure 3.2. Cartesian plot documenting the aircraft's position relative to SLC-40 and the measured HCL concentration throughout the 100 minute K-23 exhaust cloud sampling mission.

3.3.2 HCl Concentration Hits as a Function of Bearing from SLC-40

Figure 3.3 substantiates that the aircraft focused on a modest range of polar angles relative to the launch complex. In this report, the angles reported will conform to the convention of rawinsonde wind vectors (the angle from which the wind originates that would push the plume to the sampled position). Thus, the angles are related by

$$\vartheta = 180 + \Phi \quad , \qquad 3.1$$

where ϑ is the equivalent rawinsonde wind angle, and Φ is the measured polar angle of the aircraft relative to SLC-40 and clockwise of true north. For example, when the aircraft is due east of SLC-40, Φ is 90°, and ϑ is 270°. The nominal trajectory of the ground cloud was shown by 3-D imagery to be 249° in a previous report and in Figure 3.1. The T-0.3 hr rawinsonde wind vectors of the bottom, middle, and top of the ground cloud were 235°, 261°, and 280°, respectively, also documented in Figure 3.1. Referring to Fig. 3.3, we will document that there are two groups of HCl aircraft hits (0-50 min and 55-80 min). Subsequent data will show that hits within the first group (0-50 min) are at relatively low altitude (400–1500 m) along the nominal ground cloud track (250 +/– 20°). The second group (55–80 min) of hits occur at higher altitude (2000-3500 m) and are located south (290 +/– 30°) of the nominal ground track. It is our preliminary conclusion that the first group of hits derive from sampling of the ground cloud as it is defined by REEDM and visualized by imagery. The second group of hits apparently derives from the launch column of the vehicle exhaust that was deposited in the higher altitude range and remained southwest and aloft of the ground cloud as documented by imagery during the first 20 minutes following launch.

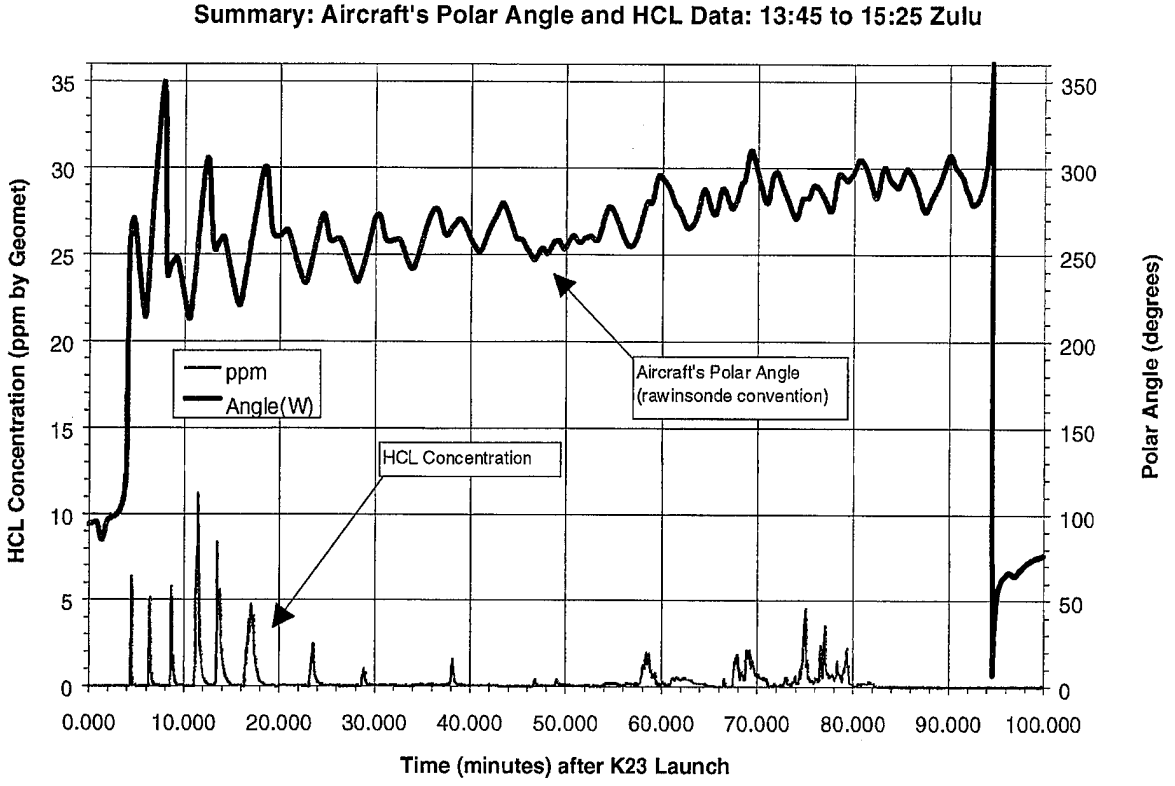


Figure 3.3. Summary the aircraft's HCl concentration measurements and its polar angles (rawinsonde convention) plotted against time (minutes) after the Titan IV K-23 launch.

3.3.3 HCl Concentration Hits as a Function of Radial Distance from SLC-40

Figure 3.4 can be used to illustrate several logical conclusions regarding the aircraft's sampling campaign. The highest HCl concentrations are encountered at early times and in close proximity (<7 km) to the launch complex. However, significant HCl concentrations (2–4 ppm) were observed at late times and at ranges of 10 +/– 2 km from SLC-40. As shown in Figure 3.5 and discussed below, these later hits were at high altitude. All HCl hits representative of the stabilized ground cloud, both initially and after downwind dispersion, were observed along the 250 +/– 20° track discussed in the previous paragraphs. The most remote sampling of the ground cloud occurred 50 minutes after launch and at 16 km from the SLC-40 launch pad. These remote HCl concentrations, although significant, were extremely low compared to high altitude and more proximal cloud samplings.

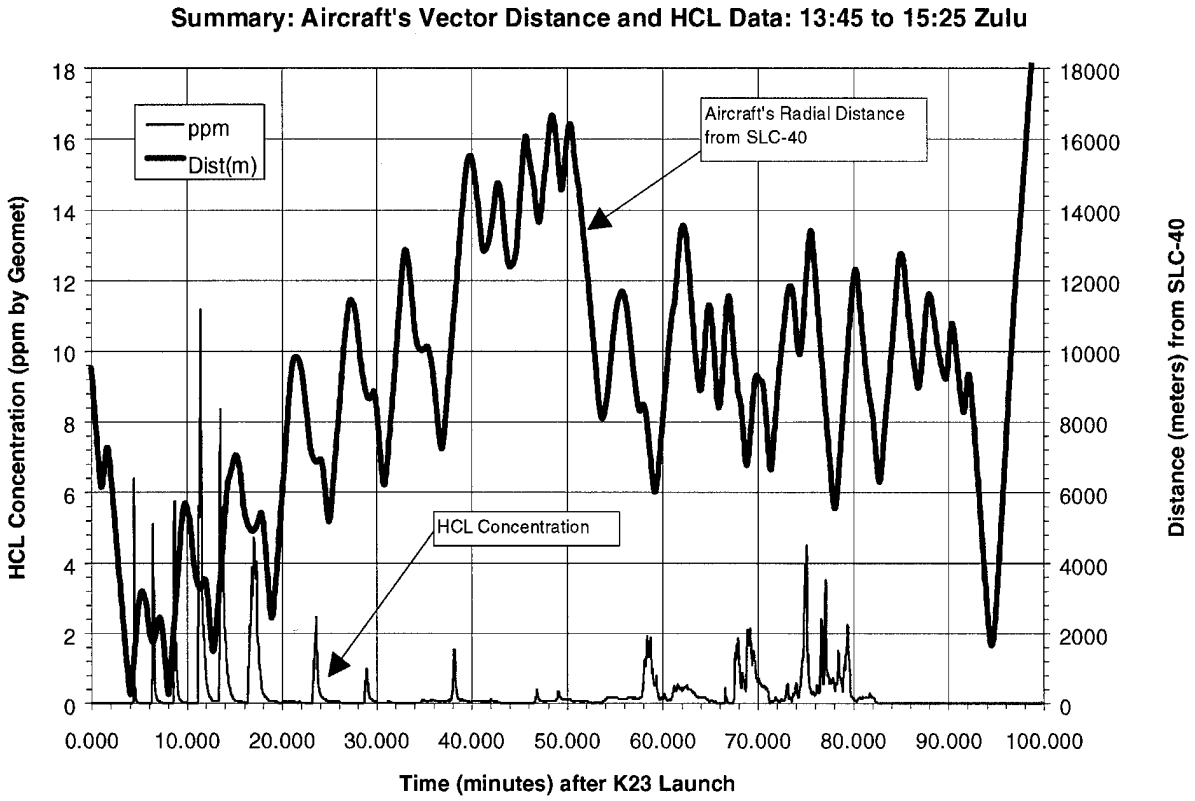


Figure 3.4. Summary of the aircraft's HCl concentration measurements and radial distances (m) from SLC-40 plotted against time (minutes) after the Titan IV K-23 launch.

3.3.4 HCl Concentration Hits as a Function of Altitude

Figure 3.5 documents that the early time (0-50 min) HCl hits resulted from fly-throughs of the rising and stabilized ground cloud at altitudes below 1500 m. 3-D imagery concluded that the top of the ground cloud stabilized at altitudes between 1500 to 2000 m after an initial rise to 2200 m. Given the altitude range, radial distance range, and polar angle range covered in the time period of 30-60 min, it is perhaps surprising that so few HCl hits were observed. Examination of Figure 3.5 shows that the late time hits (60–80 min) all occurred at an altitude of roughly 2200 m and a bearing (Figure 3.3) of roughly 290 +/– 30°. No HCl hits were detected below 2000 m as the plane descended (80–100 min) beneath this high altitude HCl cloud. Therefore, the launch column derived cloud does not result in measurable dispersion to low altitudes for over 100 min. As noted in Figure 3.1, T-0.3 hr rawinsonde wind vectors at the highest altitude (2200 m) reached by the rising ground cloud (i.e., revealed by imagery) were typically 280° (i.e., close to the bearing of the aircraft's high altitude HCl hits).

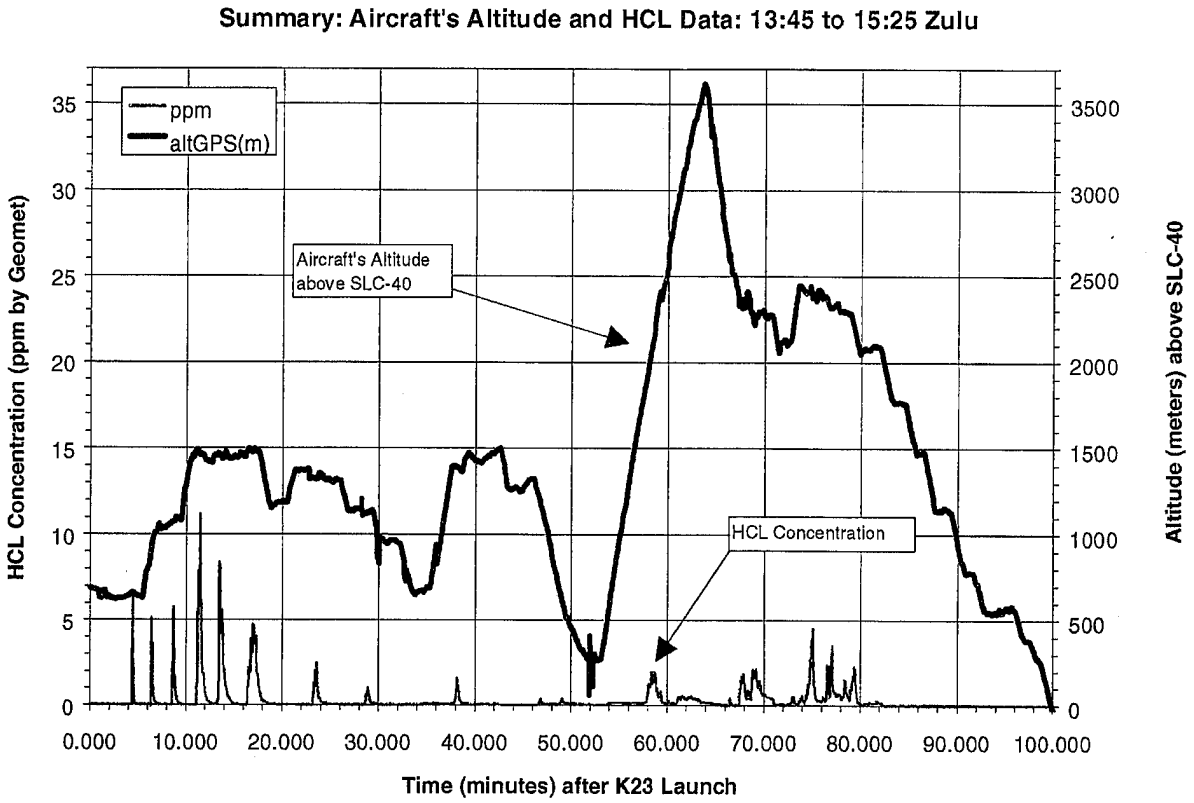


Figure 3.5. Summary of the aircraft's HCl concentration measurements and altitude (m) plotted against time (minutes) after the Titan IV K-23 launch.

3.3.5 HCl Concentration Hits as a Function of Altitude and Aircraft Position

This section will provide substantiation for observations made in previous portions of this overview of the aircraft sampling data. The figures referenced in this section are subsets of the data presented in the Cartesian plot in Figure 3.2.

3.3.5.1 HCl Hits at Altitudes Greater than 2000 m

Figure 3.6 depicts only the highest altitude aircraft sampling data in a Cartesian plot centered at SLC-40. As previously noted, the observed HCl hits at high altitudes are in the southeast quadrant relative to SLC-40. They occur at late times (60–80 min) and in a fairly narrow altitude range centered around 2200 m. It is noteworthy that the imagery of launch cloud documented extensive dispersed plume material above and to the south of the ground cloud. Since no high-altitude track was flown in the northeast quadrant, it is not appropriate to conclude that no detectable high-altitude HCl exists there.

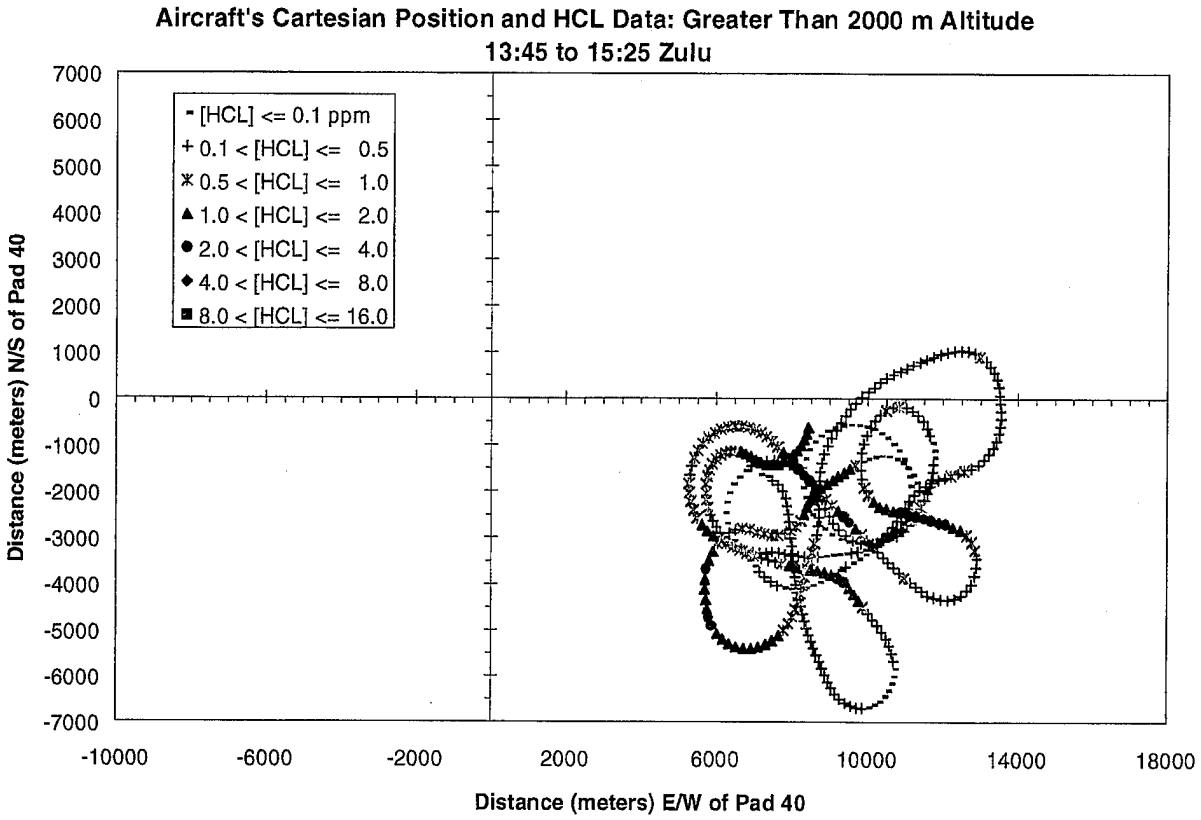


Figure 3.6. Summary Cartesian plot documenting the aircraft's position and measured HCl concentrations while sampling at altitudes greater than 2000 m after the Titan IV K-23 launch. The aircraft only sampled altitudes greater than 2000 m at times between 58 and 83 minutes after the K-23 launch.

3.3.5.2 HCl Hits at Altitudes Less than 2000 m

The majority of the stabilized K-23 ground cloud — as determined by 3-D plume imagery — lies below 2000 m and along a plume track centered on 250°. Examination Figure 3.7 shows this observation is consistent with the position of the major HCl hits during aircraft plume transects at altitudes below 2000 m. Figure 3.7 also documents that the southeastern high-altitude cloud does not result in measurable low altitude HCl concentrations.

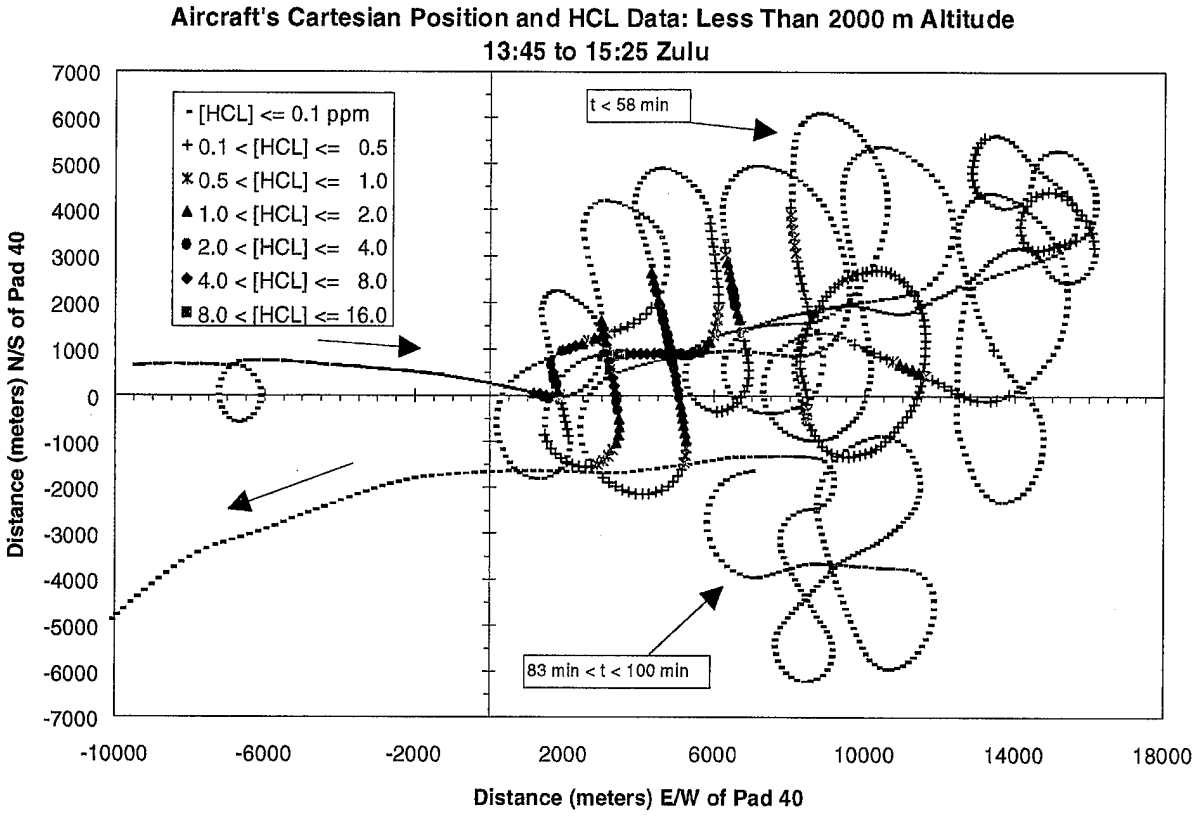


Figure 3.7. Summary Cartesian plot documenting the aircraft's position and measured HCl concentrations while sampling at altitudes less than 2000 m after the Titan IV K-23 launch. The aircraft only flew at altitudes less than 2000 m during two time periods: 1) 0 to 58 minutes while sampling the ground cloud as it moved into the Northeast quadrant and 2) 83 to 100 minutes while spiraling to lower altitudes beneath the high altitude plume documented in Figure 3.6 in the Southeast quadrant.

3.3.5.3 HCl Hits at Altitudes Less than 1000 m

A small fraction of the aircraft flight time was spent at altitudes below 1000 m. Figure 3.8 shows that the only major hits were at short times (< 8 min) at small distances (< 2.5 km) from the launch complex. There were, however, measurable levels of HCl at later times (47–55 min), at lower altitudes (400–700 m), at remote distances (13–16 km), and at similar angles (245–260°) to the ground cloud trajectory (into the northeast quadrant). These data are qualitatively consistent with downward dispersion from the ground cloud.

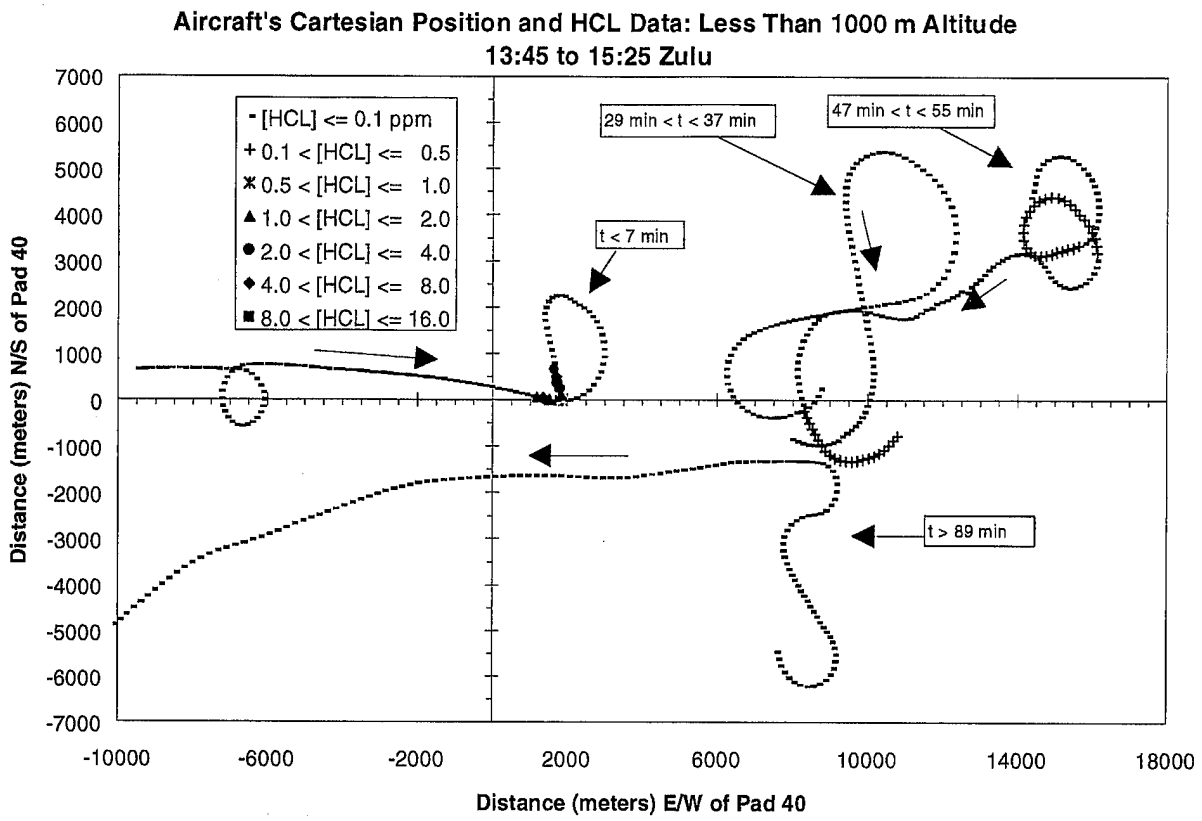


Figure 3.8. Summary Cartesian plot documenting the aircraft's position and measured HCl concentrations while sampling at altitudes less than 1000 m after the Titan IV K-23 launch. The aircraft flew at altitudes less than 1000 m during four time periods: 1) 0 to 7 minutes while sampling the ground cloud immediately adjacent to SLC-40, 2) 29 to 37 minutes while flying beneath the ground cloud in the northeast quadrant, 3) 47 to 55 minutes while flying through the bottom of the ground cloud in the northeast quadrant and climbing into the high-altitude cloud in the Southeast quadrant; and 4) 83 to 100 minutes while passing beneath the high-altitude HCl cloud in the Southeast quadrant (see Figure 3.6).

3.3.5.4 HCl Hits at Altitudes Less than 500 m

Only one brief period (50–56 min) was flown at altitudes below 500 m. The "plus" symbols in Figure 3.9 show a minor hit (0.1 < HCl < 0.5 ppm) along the nominal ground cloud track at a distance of roughly 16 km from the complex in the northeast quadrant. These hits extend to 400 meters, which was the lowest altitude sampled by the aircraft, and document measurable dispersion of the ground cloud to these altitudes some 50 minutes after the launch and 16 km from the SLC-40 launch pad.

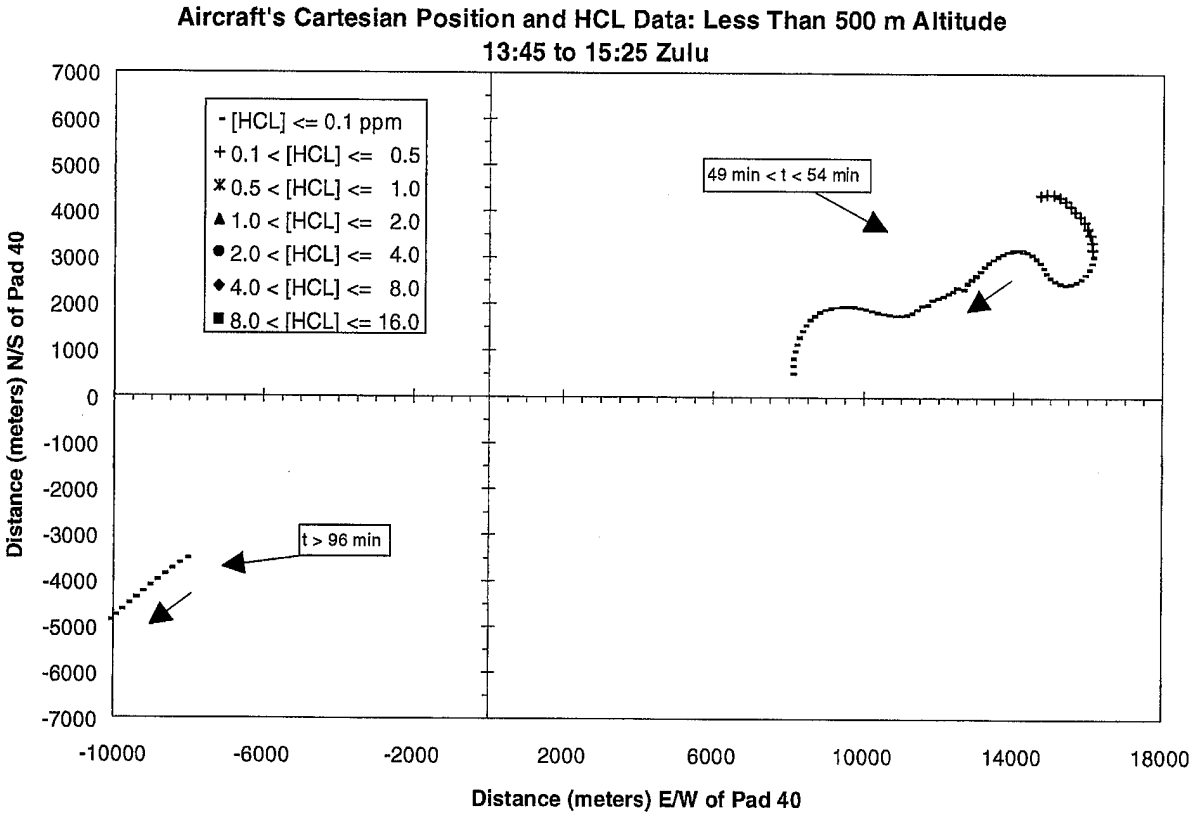


Figure 3.9. Summary Cartesian plot documenting the aircraft's position and measured HCl concentrations while sampling at altitudes less than 500 m after the Titan IV K-23 launch. The aircraft flew at altitudes less than 500 m during two time periods: 1) 49 to 54 minutes while flying through the bottom of the ground cloud in the Northeast quadrant; and 2) 96 to 100 minutes while returning to the airport after sampling beneath the high-altitude HCl cloud in the Southeast quadrant (see Figure 3.6).

3.4 Conclusions

The aircraft's Geomet total HCl detector monitored the effluent plume from the Titan IV K-23 launch and obtained a large quantity of HCl concentration data as a function of time, altitude, and horizontal coordinates of the aircraft. The aircraft's HCl concentration data documented two distinct portions of the launch's exhaust cloud.

The HCl concentration distributions below 2000 m altitudes are consistent with imagery derived ground cloud trajectory (i.e., 250° +/– 20°) and dimensions. The aircraft documents measurable levels of HCl to altitudes as low as 400 m beneath the ground cloud's trajectory some 50 minutes after the launch and 16 km from SLC-40 launch pad. In a separate report, we will correlate the aircraft's HCl measurements with the imagery for the first 20 minutes after launch to document the dimensions and concentration distributions within the rising and stabilized ground cloud.

The HCl concentrations, measured by the aircraft above 2000 m altitude and at times greater than 55 minutes after the launch, document a high-altitude HCl cloud southwest of the ground cloud and southeast of the SLC-40 launch pad (280° +/– 30°). It appears that these higher altitude HCl hits resulted from the launch column that was originally deposited at relatively high altitudes. At high altitudes, the low wind speed and wind orientations from the west-northwest would have pushed the launch column cloud into the

low wind speed and wind orientations from the west-northwest would have pushed the launch column cloud into the southeast quadrant with respect to SLC-40. The aircraft's HCl concentration distributions document that this high altitude cloud does not result in detectable HCl below 2000 m altitude during the first 100 minutes after launch. In a separate report, we will provide a series of polar, Cartesian, and time plots for each ten minute increment in the aircraft's K-23 mission. In addition to plume concentrations, angular spreads and along-wind plume dimensions were extractable for favorable transects. This subsequent detailed data review will provide dispersion modelers with concentration profiles that can be readily compared with dispersion model runs.

4. Ground-Level HCl Dosimetry and Preparation of Instrument for Measuring Airborne HCl Concentrations

[The material in this section was contributed by Dale Lueck, Dan Curran, Ronald Barile, and Barry Meneghelli of NASA KSC's Toxic Vapor Detection/Contamination Monitoring Laboratory.]

4.1 Dosimeter Monitoring

The primary goal for HCl dosimeter monitoring during the #K23 Titan IV launch was collection of ground level data from far-field locations. One hundred dosimeters were fabricated and staged with the equipment required for rapid deployment. The calibration data for the prepared dosimeters are shown in Figure 4.1. Deployment was scheduled to be conducted during the several hours prior to the opening of the launch window [approximately 0730 (11:30 Zulu time) on 14 May 95]. Two deployment teams assembled at 0500 and awaited REEDM predictions at the TVD/CML. The early morning ground-level winds being light and variable apparently made plume movement predictions difficult. The REEDM predictions at 0600 called for the exhaust plume to move east over the ocean, conditions that made far-field ground sampling data unattainable. As a contingency, a total of forty-two HCl dosimeters were deployed within a 30,000 foot radius of the launch complex 40. South of the guard gate on Samuel Phillips Parkway at Complex 37, twenty-three dosimeters were deployed. Nineteen dosimeters were deployed on Static Test Road, Schwartz Road and Samuel Phillips Parkway north of the guard gate just south of Pad 39A (Figure 4.2). Access to Samuel Phillips Parkway between the guard gates at Complex 37 and Pad 39A was not approved.

Several dosimeters were provided to Air Force personnel for near-field placement around the launch complex. A total of nine dosimeters dosimeters were placed around Complex 40 the evening prior to launch day. Five dosimeters were deployed on the perimeter fence five feet above ground level approximately 600 ft (180 meters) from the vehicle. Four dosimeters were placed inside the fence, one on each lightning tower approximately 150 feet (45 meters) from the vehicle. The approximate placement and HCl dose measured by these near field dosimeters is shown in Figure 4.3.

4.2 Ground Level Monitoring Results

The dosimeters placed in the vicinity of launch complex 40 were the only dosimeters that showed response indicating the presence of HCl. The HCl exposure doses recorded with these dosimeters are shown in Table 4.1. The highest doses were recorded at the lightning towers on either side of the flame trench, east of the vehicle. From the HCl levels recorded by the dosimeters on the perimeter fence, it appears that the majority of the ground level HCl moved to the east, south east. However, low levels of HCl were detected at each of the other perimeter fence locations. Dosimeters placed in the same sites during the 22 Dec 94 launch did not detect HCl at any of the perimeter fence locations. This may indicate that during warmer weather conditions the effluent plume does not rise as quickly as it does when ambient temperatures are cooler.

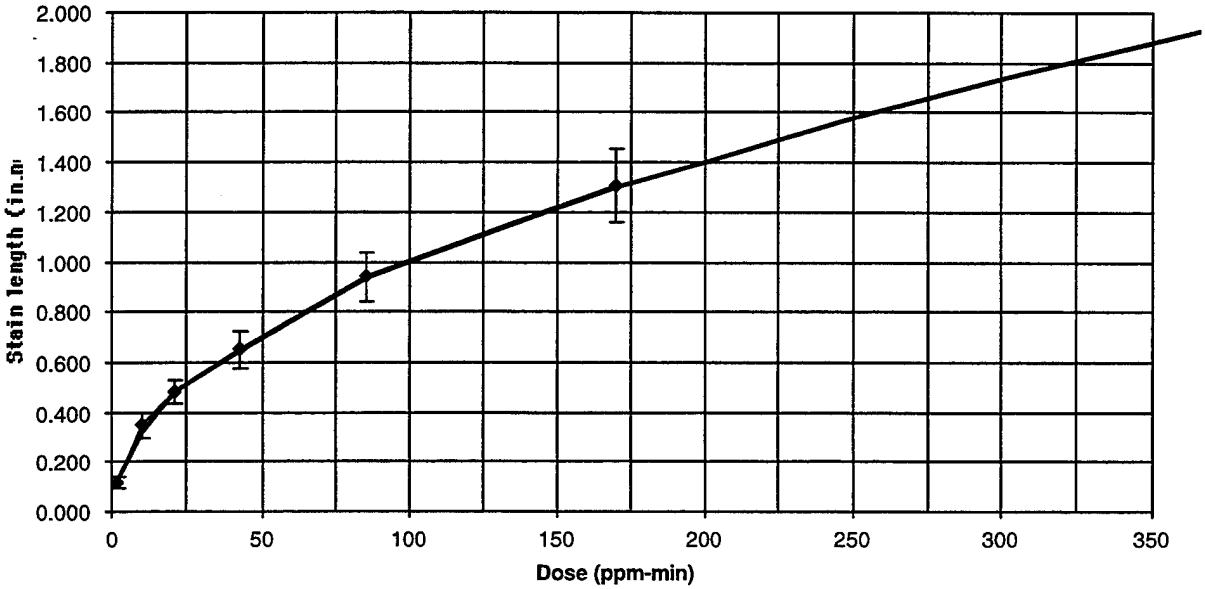


Figure 4.1. Calibration results for set of five dosimeters from batch deployed during 14 May 95 Titan IV launch. Error bars represent ± two standard deviations.

Table 4.1. Near-field HCl Dosimeter Location, Stain Measurements, and Doses

Dosimeter Location Distance from Vehicle	Stain Length (in.)	Dose (ppm-min)
ENE Perimeter Fence, 600 ft.	0.110	1.4
ESE Perimeter Fence, 600 ft.	1.025	105.4
SSE Perimeter Fence, 600 ft.	0.419	18.8
W Perimeter Fence, 600 ft.	0.100	1.2
NNW Perimeter Fence, 600 ft.	0.155	2.8
NE Lightning Tower, 150 ft.	1.9+(saturated)	350+
SE Lightning Tower, 150 ft.	1.9+(saturated)	350+
NW Lightning Tower, 150 ft.	1.420	197.6
SW Lightning Tower, 150 ft.	1.210	145.1

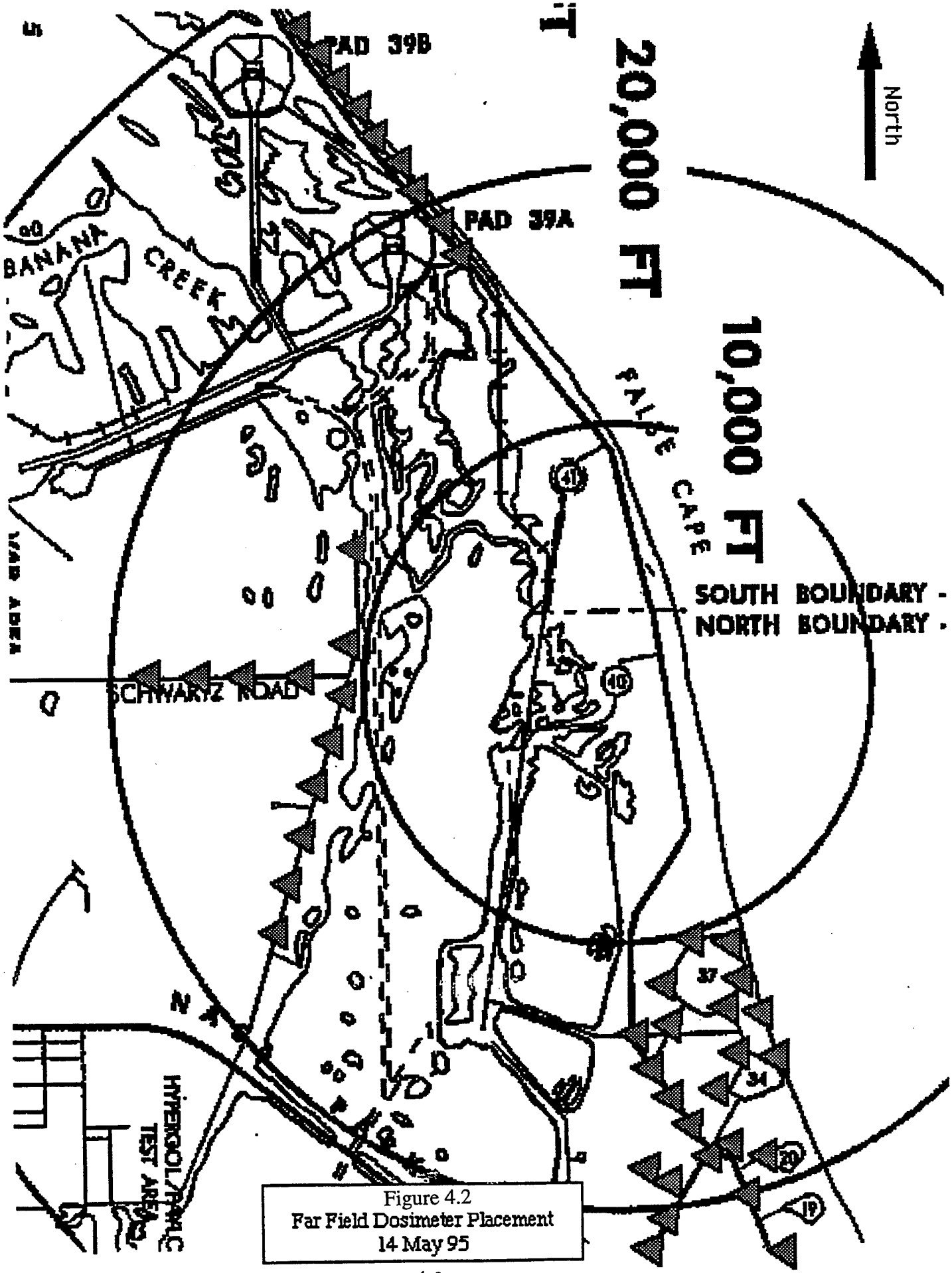


Figure 4.2
Far Field Dosimeter Placement
14 May 95

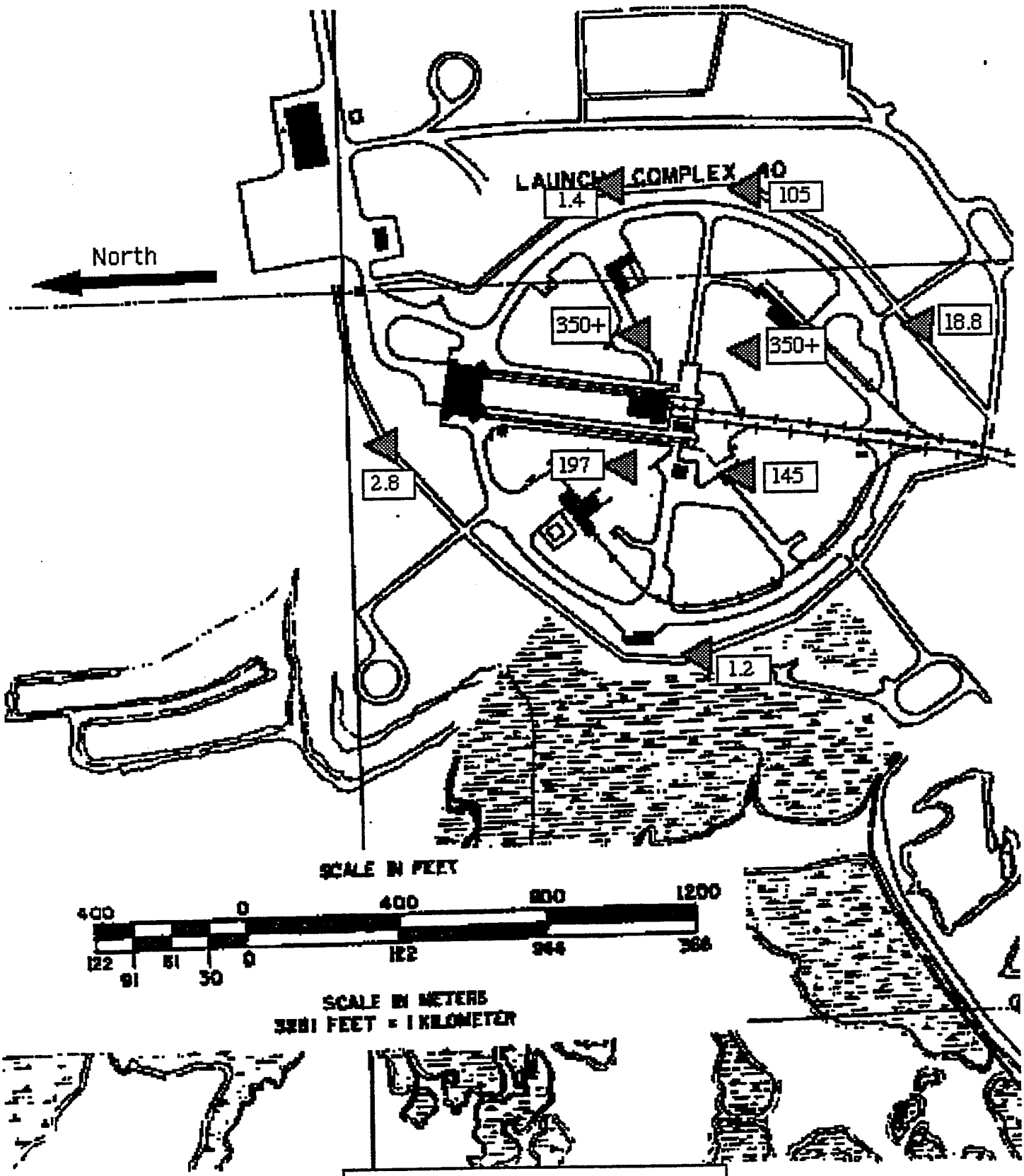


Figure 4.3
Near Field Dosimeter Placement
Dosimeter Location
Recorded Dose

4.3 Preparation of Geomet Instrument for Airborne Sampling

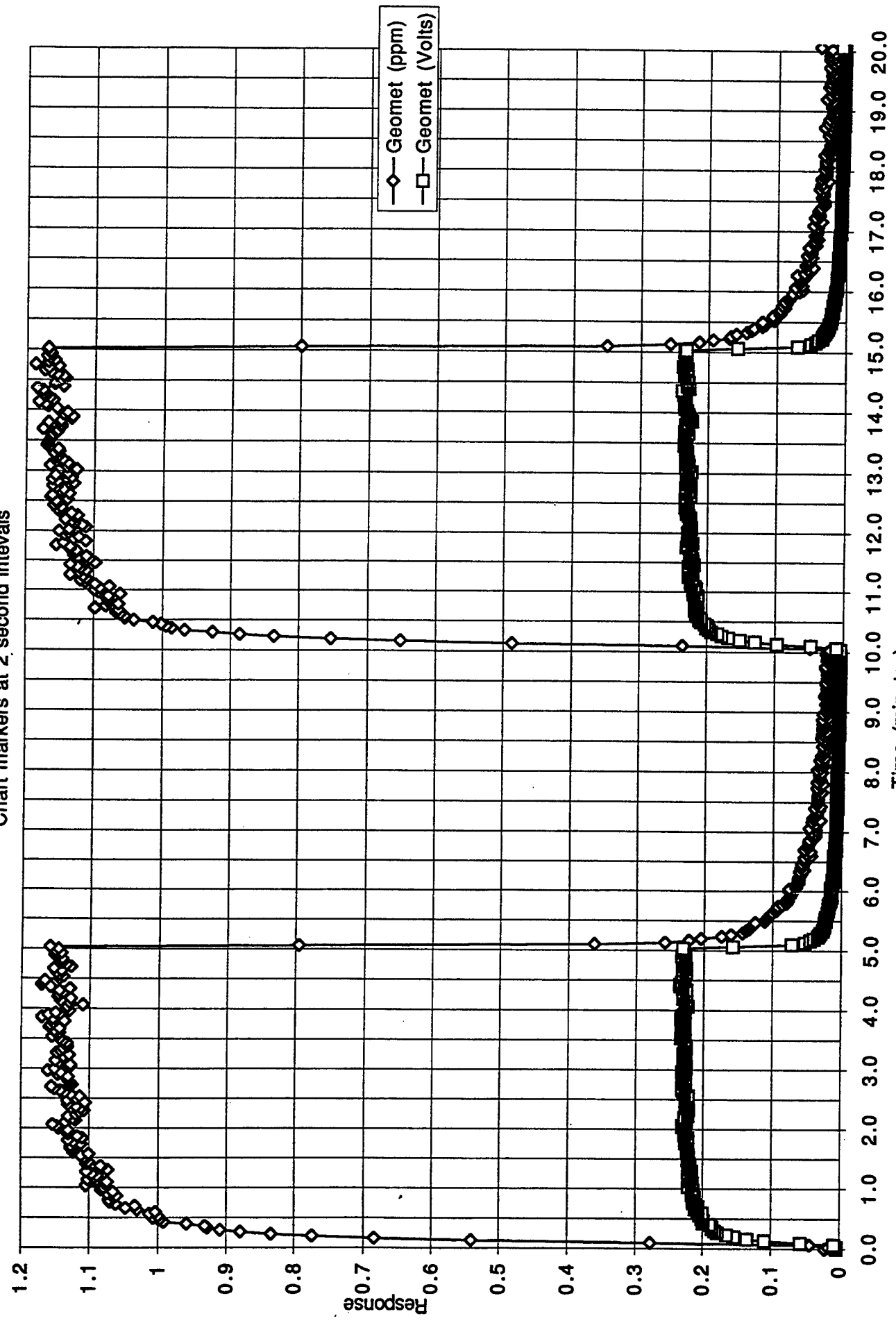
At the request of the 45th Space Wing Bioenvironmental Engineering Office, one Geomet Model 401B HCl detector was modified and calibrated for airborne effluent plume sampling during the 14 May 95 Titan IV launch. A Piper (PA-44-180) Seminole, twin-engine, four-seat aircraft was used for the plume sampling. The Geomet instrument detects gaseous- or aerosol-based HCl through the use of a luminol-based chemiluminescence reaction. Under laboratory conditions the instrument has a minimum detectable sensitivity of 0.01 ppm of HCl, 5% accuracy, 5% reproducibility, 5% linearity, a noise level of less than 1%, and a 1-second response and recovery time. The limited space available in the nose of the aircraft required that the vapor inlet port be changed from the top of the instrument to the side. A four-foot length of ceramic inlet tube was procured to allow direct transport of the vapor sample from outside of the aircraft to the detector without loss of sample due to adsorption on other surfaces. Because the instrument was oriented with the back side facing down, the liquid chemical supply and waste reservoirs had to be located remotely and tubing lengths were added.

Due to limited time available before the launch and the number of modifications required to allow the unit to be fitted in the aircraft, a complete set of pre-flight qualification tests was not possible. The instrument was calibrated on 11 May 95 at the TVD/CML using a verified vapor sample of 1.1 ppm HCl at 50% R/H and 23 °C. The instrument was then delivered and mounted into the aircraft. After the instrument was installed, some verification tests were performed to confirm unit operation and response while mounted in the flight monitoring position. The unit was functioning properly and responded as expected during these pre-flight tests.

The instrument was returned to the TVD/CML shortly after the monitoring flight was completed. At approximately 1400 h on 14 May 95 a post calibration was performed on the instrument. The instrument was powered up and allowed to stabilize while sampling HCl free air. A baseline shift of less than 0.01 ppm was noted. The unit calibration stability was then evaluated by alternately sample HCl-free air and air mixtures containing 1.1 ppm HCl vapor (see Figure 4.4). The instrument responded within 10% of the calibrated value during post calibration testing.

During this airborne launch monitoring exercise, a functional configuration for the Geomet was firmly established and seemed to perform well. The implementation of Geomet test and calibration procedures as well as the establishment of good interface with the other Titan IV program contractors has laid the foundation for future airborne monitoring activities, if required. The reliability and usefulness of the data collected will only increase with the routine execution of the procedures established for this flight.

Figure 4.4 Response Data from Geomet precalibration prior to Airborne HCl Sampling flight May 14, 1995
Insrument was sampling through a 4 ft. section of coated ceramic tubing in the exact orientation as in the aircraft.
Sample rate: 2.2 liters/minute Sample concentration: 1.1 ppm
Chart markers at 2 second intevals



Appendix A- The REEDM Code

[Material in this Appendix was contributed by Bart Lundblad of The Aerospace Corporation's Environmental Systems Directorate]

The Rocket Exhaust Effluent Diffusion Model (REEDM) is used by range safety offices at the Eastern and Western Ranges to predict toxic hazard corridors (THCs) for a variety of launch vehicles, including Titan and Delta. The code was developed in 1982 for the Air Force by H.E. Cramer Co. Development was based on the earlier NASA multi-layer diffusion model. REEDM is currently operated and periodically modified by a range safety contractor. The latest version can run on a personal computer in several minutes. REEDM calculates atmospheric toxic concentrations based on vehicle emission, meteorological, and launch scenario data provided by the user. Although based on relatively simple atmospheric dispersion physics, the code is complex with a large number of variables.

REEDM has not been fully validated and the accuracy of its concentration predictions has been questioned. Key factors determining predicted values include the cloud source terms, cloud rise and stabilization, cloud transport, cloud diffusion, and atmospheric chemistry.

- **Source Term:** REEDM predicts vehicle-specific initial cloud characteristics for both nominal launch and catastrophic failure cases. These characteristics include mass, temperature, buoyancy, and upward momentum. The model does not fully account for exhaust interaction with the launch mount and deluge water. It also does not account for HCl removal via washout, impingement, and rainout.

- **Cloud Rise and Stabilization:** REEDM uses the initial cloud characteristics and the meteorological profile to predict exhaust cloud rise and stabilization. The altitude of the predicted stabilization and the distribution of the cloud about the stabilization height are important determiners of predicted ground-level concentrations. Questions persist as to whether REEDM correctly predicts cloud stabilization heights, and if it properly accounts for cloud interaction with inversion layers that tend to inhibit cloud rise. It is also thought to inaccurately predict air entrainment rates and distribution of cloud mass.

- **Transport:** REEDM uses a single mean wind vector to predict the downwind trajectory of the stabilized cloud. The vector is calculated by averaging wind vectors from the measured wind profile. This simple method will not produce accurate cloud trajectories. In addition, REEDM does not account for changes in wind direction as the cloud moves downwind. Use of a single wind vector results in predictions of straight line cloud trajectory. This method cannot accurately portray true cloud movement.

- **Diffusion:** REEDM uses parameters of atmospheric turbulence to predict the rate at which toxic species in the elevated cloud will diffuse back down to ground-level. The diffusion rate used by the model is crucial to the prediction of ground-level

concentration isopleths. The simple Gaussian diffusion scheme used by REEDM is probably not valid for elevated cloud diffusion. The stabilized cloud may tend to remain elevated and not readily diffuse to ground-level.

- **Cloud Chemistry:** REEDM does not account for atmospheric chemical reactions of the launch cloud's toxic species. REEDM assumes that all HCl emitted remains in the cloud as gaseous HCl. There are important toxic removal processes occurring in the clouds that will reduce toxic ground-level concentrations. A valid model must account for these reactions.

Appendix B- Atmospheric Model Validation Program Activities

[Material in this Appendix was contributed by Bart Lundblad of The Aerospace Corporation's Environmental Systems Directorate]

The Atmospheric Dispersion Model Validation Program (MVP) is carrying out three major activities designed to validate REEDM: (A) the verification of REEDM's code, (B) the evaluation of REEDM's performance using empirical dispersion data, and (C) the establishment of the prediction confidence limits of REEDM based on the code and performance evaluations.

A. Code Verification

The REEDM code is being subjected to a rigorous review of its construction, equations, assumptions, default values, and uncertainties by a team of personnel with expertise in atmospheric modeling. This code verification process is providing a complete explanation of how the model uses input data to produce toxic concentration isopleths, including the inherent limitations that accompany these predictions. The code verification process will improve the understanding of the accuracy of code output and will provide essential information for ultimate model validation.

B. Model Performance Evaluation

The performance of REEDM in producing accurate toxic concentration predictions is being evaluated using empirical data collected during the monitoring of launch clouds and tracer gases. This evaluation process has three components: data collection, data archiving, and model comparison.

Data Collection: The launch ground clouds produced by nominal launches at the Eastern and Western Ranges are being monitored to collect data on cloud rise, growth, stabilization height, trajectory, diffusion, and toxic ground concentrations. Cloud monitoring potentially includes remote imagery (visible, infrared, and lidar) and both aerial and ground sampling of cloud constituents.

Releases of tracer gas (non toxic, invisible, and inert) at the Eastern and Western Ranges are being employed to supplement the launch cloud monitoring data. The tracer gas is released at various altitudes during non-launch periods to simulate sections of a stabilized toxic cloud. The puffs and plumes of tracer gas are remotely imaged with infrared cameras and also detected in the air and at ground level. The tracer release activity will provide valuable information on cloud trajectory and diffusion patterns in the coastal environments at the ranges. Tracer release sessions are being conducted during different seasons of the year to account for seasonal variations in dispersion characteristics.

An important part of the field data collection activity is the production of a complimentary meteorological data package that can be used to evaluate the meteorological portions of REEDM. Data provided by the existing range

meteorological network will be supplemented, as necessary, by the MVP to ensure that all necessary meteorological data are collected.

Data Archiving: A computerized data storage system will be created to archive cloud dispersion and meteorological data collected during the field activities. The data will be reviewed and reduced prior to archiving. The system will enable a rapid and accurate delivery of requested data to REEDM evaluators. The archive will remain as a valuable resource to be utilized during the evaluations of future range dispersion models.

Model Comparison: Model evaluators will run REEDM using archived meteorological data and compare its output with the empirical cloud dispersion data collected during the field activities. The cloud imagery data will be used to evaluate how closely REEDM can simulate cloud rise growth, and stabilization. Imagery and aerial sampling of the launch and tracer clouds will permit evaluation of cloud trajectory and diffusion. The ground sampling data will allow a direct comparison between REEDM toxic concentration isopleths and the actual gas concentration detected at ground level. The aerial and ground sampling will also provide real cloud chemical composition data that will assist evaluation of atmospheric chemical reactions and conversions. The evaluation team will report on the overall accuracy of the REEDM predictions as well as the accuracy of each REEDM component: cloud rise, transport, diffusion, and ground concentration.

C. Establishment of Confidence Limits

The MVP will use the knowledge gained from the REEDM code examination and the REEDM performance evaluation to establish confidence limits for REEDM use and thereby validate REEDM. These confidence limits will be based on REEDM's strengths and weaknesses and will provide guidance on interpretation of model predictions. Establishment of the confidence limits will validate REEDM by providing a firm basis for REEDM use at the ranges.

Appendix C- REEDM Code Calculations of Cloud Stabilization Heights and Ground-Level HCl Exposure Doses

[Material in this Appendix was contributed by Douglas Schulthess of The Aerospace Corporation's Eastern Range Systems Engineering Directorate]

REEDM code calculations of cloud stabilization heights and ground-level HCl exposure doses are presented here from Rawinsonde data determined at both T - 0.3 (13:27 Zulu time) and T - 1.4 hours (12:22 Zulu time).

1. Cloud Stabilization Heights Calculated from T–0.3 h Rawinsonde Data

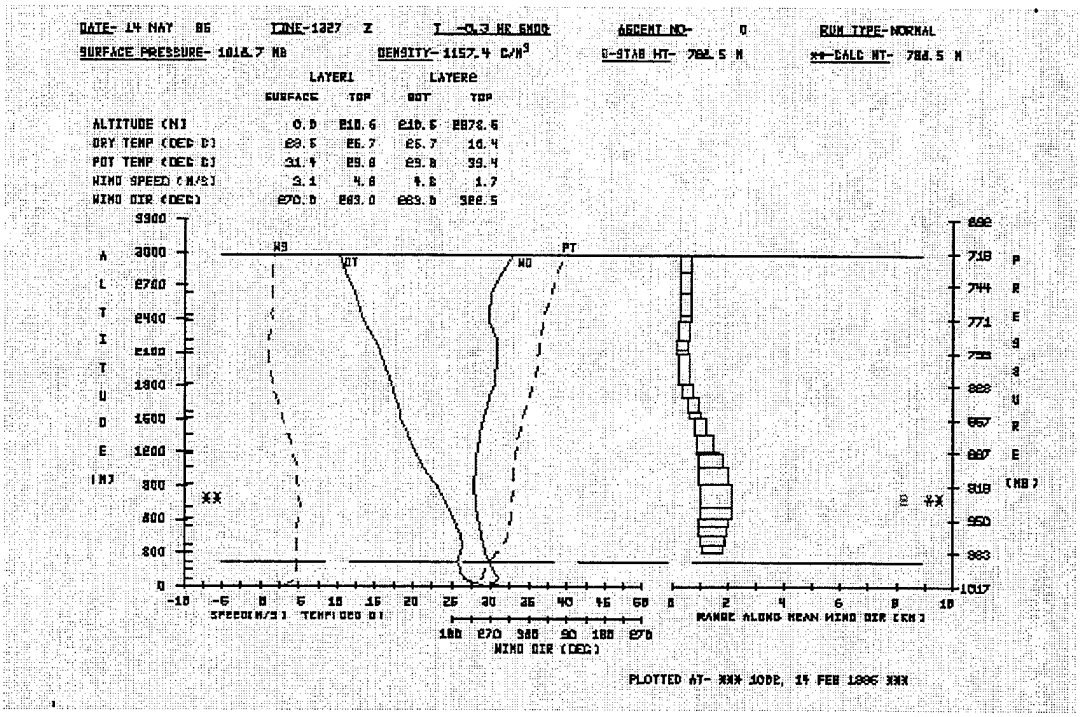


Figure C-1: Meteorological Data for 1327 Rawinsonde Sounding (K-23 Launch: -0.3 HR)

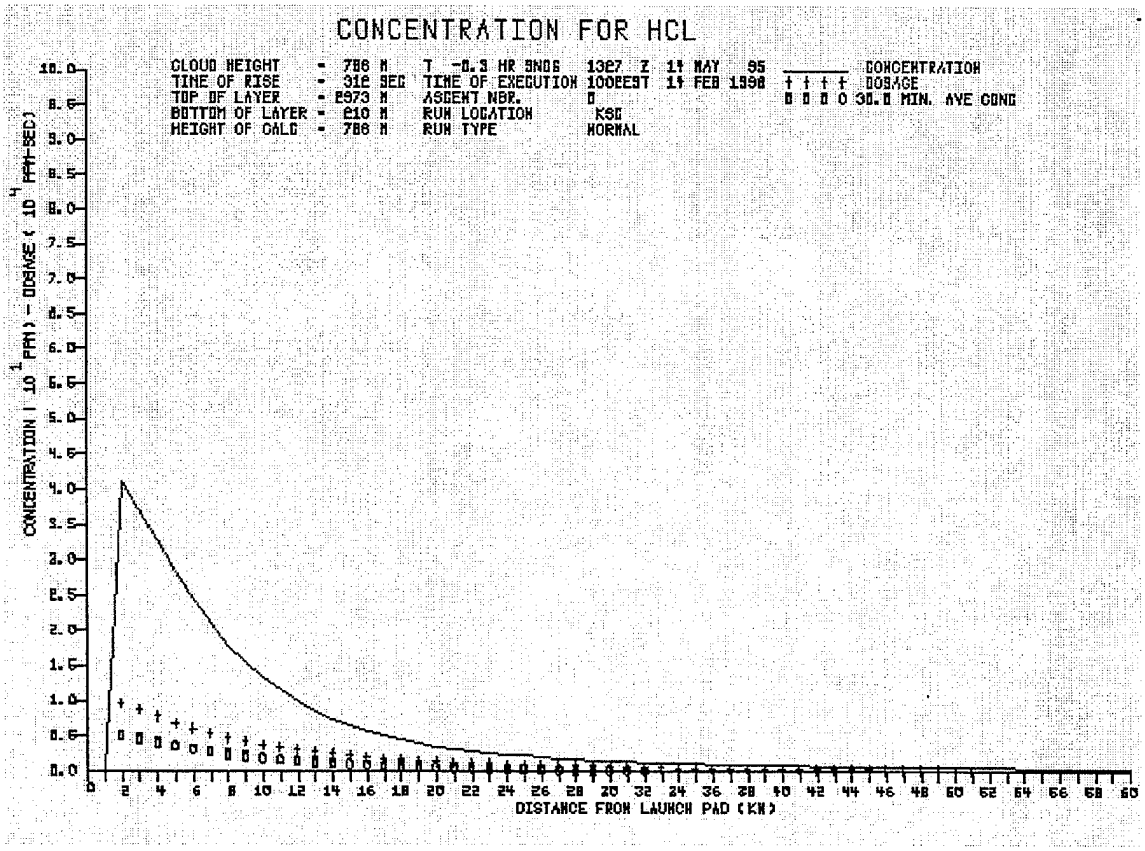


Figure C-2: REEDM's HCL predictions for the Stabilized Launch Cloud using 1327 Rawinsonde Data (K-23 Launch: -0.3 HR).

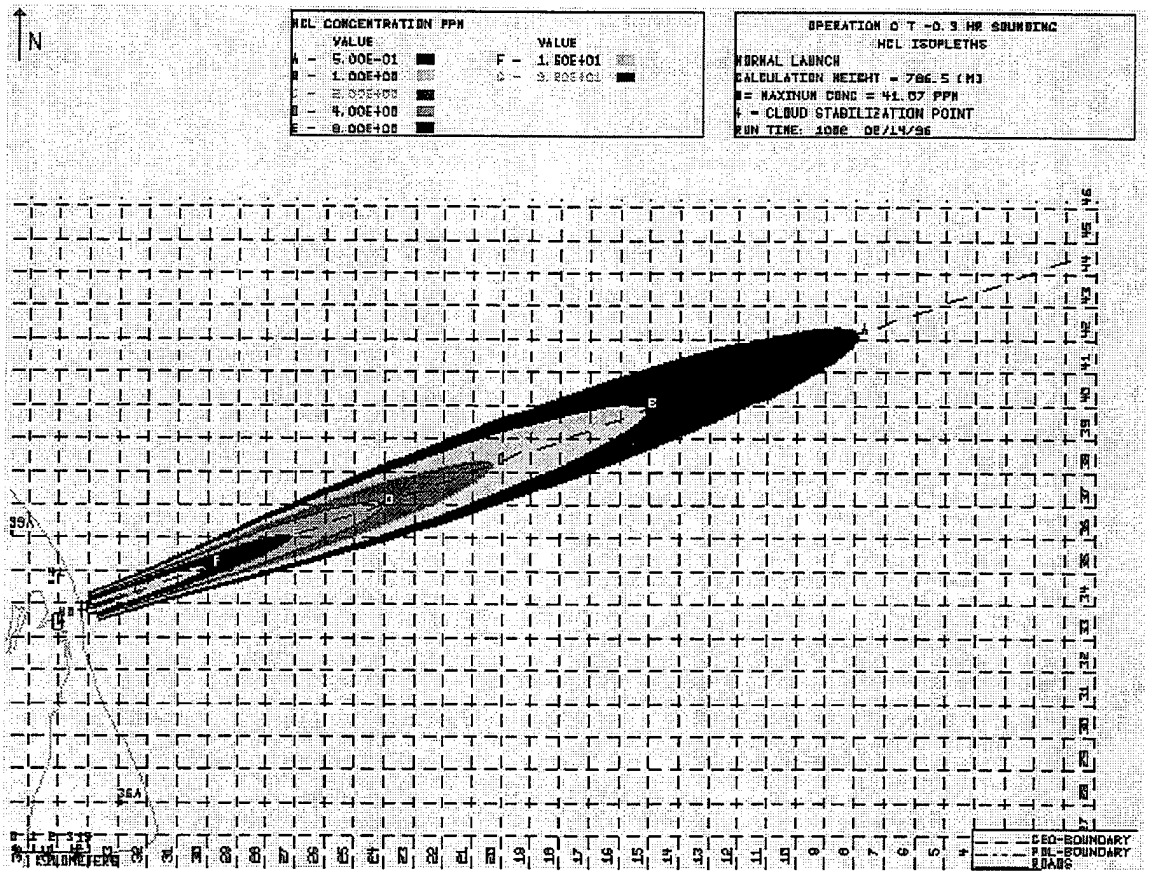


Figure C-3: REEDM HCL Concentration Isopleths for the Stabilized Launch Cloud using 1327 Rawinsonde Data (K-23 Launch: -0.3 HR).

1**********

ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 2
VERSION 7.05 AT KSC
1109 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

****

----- PROGRAM OPTIONS -----

MODEL		CONCENTRATION
RUN TYPE		OPERATIONAL
WIND-FIELD TERRAIN EFFECTS MODEL		NONE
LAUNCH VEHICLE		TITAN IV
LAUNCH TYPE		NORMAL
LAUNCH COMPLEX NUMBER		40
TURBULENCE PARAMETERS ARE DETERMINED FROM		CLIMATOLOGICAL DATA
SPECIES		HCL
CLOUD SHAPE		ELLIPTICAL
CALCULATION HEIGHT		STABILIZATION
PROPELLANT TEMPERATURE (DEG. C)		25.74
CONCENTRATION AVERAGING TIME (SEC.)		1800.00
DECAY COEFFICIENT		0.0000
ABSORPTION COEFFICIENT (RNG- 0 TO 1,NO ABSORPTION=0)		0.0000
DIFFUSION COEFFICIENTS	LATERAL	1.0000
	VERTICAL	1.0000
VEHICLE AIR ENTRAINMENT PARAMETER	GAMMAE	0.6400
DOWNWIND EXPANSION DISTANCE (METERS)	LATERAL	100.00
	VERTICAL	100.00

----- DATA FILES -----

INPUT FILES

RAWINSONDE FILE	k23_1327.raw
DATA BASE FILE	rdmbase.ksc

OUTPUT FILES

PRINT FILE	k23d1327.stb
PLOT FILE	k23d1327.s_p

----- METEOROLOGICAL RAWINSONDE DATA -----

RAWINSONDE MSS/MSS
TIME- 1327 Z DATE- 14 MAY 95
ASCENT NUMBER 0

----- T -0.3 HR SOUNDING -----

MET. LEV. NO.	ALTITUDE MSL (FT)	ALTITUDE GND (FT)	GND (M)	WIND DIR (DEG)	WIND SPEED (M/S)	WIND SPEED (KTS)	AIR TEMP (DEG C)	AIR PTEMP (DEG C)	AIR DPTEMP (DEG C)	AIR PRESS (MB)	AIR RH (%)	H M	INT-ERP
1	16	0.0	0.0	270	3.1	6.0	29.5	31.4	23.9	1016.7	72.0		
2	67	51.3	15.6	275	3.5	6.7	28.8	30.7	23.5	1014.9	73.1		**
3	119	102.5	31.2	280	3.9	7.5	28.0	30.1	23.0	1013.1	74.3		**
4	170	153.8	46.9	284	4.2	8.2	27.3	29.4	22.5	1011.4	75.5		**
5	221	205.0	62.5	289	4.6	9.0	26.5	28.7	22.1	1009.6	77.0		
6	314	297.7	90.7	284	4.6	9.0	26.3	28.9	22.4	1006.4	79.2		**
7	406	390.3	119.0	279	4.6	9.0	26.2	29.1	22.8	1003.2	81.6		**
8	499	483.0	147.2	274	4.6	9.0	26.0	29.2	23.1	1000.0	84.0		
9	603	587.0	178.9	269	4.6	9.0	25.9	29.5	23.5	996.4	86.9		**
10	707	691.0	210.6	263	4.6	9.0	25.7	29.8	23.9	992.9	90.0	*	
11	854	837.5	255.3	260	4.6	8.9	25.9	30.3	23.2	987.9	85.1		**
12	1000	984.0	299.9	256	4.5	8.8	26.1	30.8	22.5	983.0	81.0		
13	1253	1237.0	377.0	251	4.6	9.0	26.4	31.6	21.2	974.4	73.0		
14	1524	1508.0	459.6	246	4.6	9.0	26.0	32.1	20.9	965.4	73.2		**
15	1795	1779.0	542.2	241	4.6	9.0	25.7	32.5	20.5	956.4	73.0		
16	2000	1984.0	604.7	239	4.9	9.5	25.2	32.5	20.1	949.7	73.0		
17	2349	2333.0	711.1	234	5.1	10.0	24.4	32.7	19.4	938.3	74.0		
18	3000	2984.0	909.5	231	4.8	9.3	22.8	32.9	18.2	917.4	75.0		
19	3542	3526.0	1074.7	234	4.6	9.0	21.3	33.0	17.6	900.0	80.0		
20	3921	3905.0	1190.2	236	4.1	8.0	20.4	33.2	17.3	888.3	83.0		
21	4000	3984.0	1214.3	237	4.0	7.8	20.2	33.2	17.2	885.8	83.0		
22	4462	4446.0	1355.1	243	3.6	7.0	19.2	33.5	16.7	871.6	85.0		
23	5000	4984.0	1519.1	253	2.7	5.2	18.3	34.0	14.8	855.2	80.0		
24	5163	5147.0	1568.8	256	2.6	5.0	18.2	34.4	14.2	850.0	78.0		
25	5582	5565.5	1696.4	266	2.0	3.9	17.6	35.0	13.0	837.6	74.6		**
26	6000	5984.0	1823.9	276	1.4	2.8	17.1	35.6	11.8	825.4	71.0		
27	6863	6847.0	2087.0	284	1.0	2.0	15.7	36.2	4.9	800.0	50.0		
28	7000	6984.0	2128.7	283	1.0	2.0	15.5	36.2	3.2	796.4	45.0		
29	7259	7243.0	2207.7	281	1.0	2.0	15.0	36.2	-0.5	789.1	35.0		
30	7839	7823.0	2384.5	267	1.5	3.0	13.4	36.8	5.1	772.8	57.0		
31	8000	7984.0	2433.5	266	1.4	2.7	13.2	37.0	4.2	768.3	54.0		
32	8650	8634.0	2631.6	269	1.5	3.0	12.1	37.9	2.3	750.0	51.0		
33	9272	9255.5	2821.1	294	1.4	2.8	11.0	38.7	2.7	733.6	57.5		**
34	9772	9755.5	2973.5	323	1.7	3.2	10.4	39.4	-1.0	720.4	46.5		**

* - INDICATES THE CALCULATED TOP OF THE SURFACE MIXING LAYER
** - INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

----- METEOROLOGICAL RAWINSONDE DATA -----

SURFACE AIR DENSITY (GM/M**3)	1157.37
DEFAULT CALCULATED MIXING LAYER HEIGHT (M)	210.62
CLOUD COVER IN TENTHS OF CELESTIAL DOME	0.0
CLOUD CEILING (M)	9999.0

----- PLUME RISE DATA -----

EXHAUST RATE OF MATERIAL-	(GRAMS/SEC)		4.22354E+06
TOTAL MATERIAL OUTPUT-	(GRAMS)		5.36146E+08
HEAT OUTPUT PER GRAM-	(CALORIES)		1555.5800
VEHICLE RISE TIME PARAMETERS-	(TK=(A*Z**B)+C)	A=	0.8678
		B=	0.4500
		C=	0.0000

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)	CLOUD RISE TIME (SECONDS)	CLOUD RISE RANGE (METERS)	CLOUD RISE BEARING (DEGREES)	STABILIZED CLOUD RANGE (METERS)	STABILIZED CLOUD BEARING (DEGREES)
1	15.6	2.8	4.4	91.3	0.0	0.0
2	31.2	4.4	12.0	93.4	0.0	0.0
3	46.9	6.0	18.1	95.5	0.0	0.0
4	62.5	7.6	24.8	97.9	0.0	0.0
5	90.7	10.7	35.6	100.9	0.0	0.0
6	119.0	14.2	50.9	101.8	0.0	0.0
7	147.2	18.1	68.0	101.1	0.0	0.0
8	178.9	23.0	88.1	99.4	0.0	0.0
9	210.6	28.4	111.5	97.1	0.0	0.0
10	255.3	36.8	142.8	94.0	0.0	0.0
11	299.9	46.3	182.7	90.7	0.0	0.0
12	377.0	64.7	244.3	86.8	1373.4	75.9
13	459.6	87.9	337.7	82.3	1370.1	71.9
14	542.2	115.8	452.4	78.1	1353.1	68.3
15	604.7	141.5	573.1	74.5	1375.9	66.0
16	711.1	201.3	776.7	70.2	1325.3	64.5
17	909.5	312.5 *	1477.7	62.3	1477.7	62.3
18	1074.7	312.5 *	1477.7	62.3	1477.7	62.3
19	1190.2	312.5 *	1477.7	62.3	1477.7	62.3
20	1214.3	312.5 *	1477.7	62.3	1477.7	62.3
21	1355.1	312.5 *	1477.7	62.3	1477.7	62.3
22	1519.1	312.5 *	1477.7	62.3	1477.7	62.3
23	1568.8	312.5 *	1477.7	62.3	1477.7	62.3
24	1696.4	312.5 *	1477.7	62.3	1477.7	62.3
25	1823.9	312.5 *	1477.7	62.3	1477.7	62.3
26	2087.0	312.5 *	1477.7	62.3	1477.7	62.3
27	2128.7	312.5 *	1477.7	62.3	1477.7	62.3
28	2207.7	312.5 *	1477.7	62.3	1477.7	62.3
29	2384.5	312.5 *	1477.7	62.3	1477.7	62.3
30	2433.5	312.5 *	1477.7	62.3	1477.7	62.3
31	2631.6	312.5 *	1477.7	62.3	1477.7	62.3
32	2821.1	312.5 *	1477.7	62.3	1477.7	62.3
33	2973.5	312.5 *	1477.7	62.3	1477.7	62.3

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)		LAYER SOURCE STRENGTH (GRAMS)	CLOUD UPDRAFT VELOCITY (M/S)	CLOUD RADIUS (METERS)	STD. DEVIATION ALONGWIND (METERS)	MATERIAL DIST. CROSSWIND (METERS)
1	15.6		0.00000E+00	8.9	0.0	0.0	0.0
2	31.2		0.00000E+00	10.0	0.0	0.0	0.0
3	46.9		0.00000E+00	9.9	0.0	0.0	0.0
4	62.5		0.00000E+00	9.5	0.0	0.0	0.0
5	90.7		0.00000E+00	8.5	0.0	0.0	0.0
6	119.0		0.00000E+00	7.7	0.0	0.0	0.0
7	147.2		0.00000E+00	6.9	0.0	0.0	0.0
8	178.9		0.00000E+00	6.2	0.0	0.0	0.0
9	210.6		0.00000E+00	5.6	0.0	0.0	0.0
10	255.3		0.00000E+00	5.0	0.0	0.0	0.0
11	299.9		0.00000E+00	4.5	0.0	0.0	0.0
12	377.0		1.72709E+06	3.9	360.0	167.7	167.7
13	459.6		4.18738E+06	3.3	441.3	205.6	205.6
14	542.2		6.12597E+06	2.7	498.7	232.4	232.4
15	604.7		5.62284E+06	2.2	533.8	248.7	248.7
16	711.1		1.08773E+07	1.4	560.1	261.0	261.0
17	909.5	*	2.64416E+07	0.0	574.2	267.6	267.6
18	1074.7	*	2.10760E+07	0.0	536.6	250.1	250.1
19	1190.2	*	1.06041E+07	0.0	458.8	213.8	213.8
20	1214.3	*	1.63772E+06	0.0	396.7	184.8	184.8
21	1355.1	*	4.69957E+06	0.0	286.3	133.4	133.4
22	1519.1	*	4.96034E+06	0.0	199.9	93.2	93.2
23	1568.8	*	1.44412E+06	0.0	199.9	93.2	93.2
24	1696.4	*	3.59631E+06	0.0	199.9	93.2	93.2
25	1823.9	*	3.45042E+06	0.0	199.9	93.2	93.2
26	2087.0	*	6.71817E+06	0.0	199.9	93.2	93.2
27	2128.7	*	1.02273E+06	0.0	199.9	93.2	93.2
28	2207.7	*	1.90376E+06	0.0	199.9	93.2	93.2
29	2384.5	*	4.13163E+06	0.0	199.9	93.2	93.2
30	2433.5	*	1.11677E+06	0.0	199.9	93.2	93.2
31	2631.6	*	4.38722E+06	0.0	199.9	93.2	93.2
32	2821.1	*	4.02796E+06	0.0	199.9	93.2	93.2
33	2973.5	*	3.13370E+06	0.0	199.9	93.2	93.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- CLOUD STABILIZATION -----

CALCULATION HEIGHT	(METERS)	786.45
STABILIZATION HEIGHT	(METERS)	786.45
STABILIZATION TIME	(SECS)	312.48
FIRST MIXING LAYER HEIGHT-	(METERS)	TOP = 210.62
		BASE= 0.00
SECOND SELECTED LAYER HEIGHT-	(METERS)	TOP = 2973.48
		BASE= 210.62
SIGMAR(AZ) AT THE SURFACE	(DEGREES)	13.5102
SIGMER(EL) AT THE SURFACE	(DEGREES)	2.9738

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
1	3.36	0.39	272.38	4.75	11.5724	4.0633
2	3.67	0.39	277.13	4.75	9.2409	5.5360
3	4.05	0.39	281.88	4.75	8.6320	6.1691
4	4.44	0.39	286.63	4.75	8.2705	6.6091
5	4.63	0.00	286.50	-5.00	7.9421	7.0625
6	4.63	0.00	281.50	-5.00	6.9934	6.6960
7	4.63	0.00	276.50	-5.00	6.1181	5.9631
8	4.63	0.00	271.25	-5.50	4.4578	4.3832
9	4.63	0.00	265.75	-5.50	1.9531	1.9531
10	4.60	-0.05	261.25	-3.50	1.0000	1.0000
11	4.55	-0.05	257.75	-3.50	1.0000	1.0000
12	4.58	0.10	253.50	-5.00	1.0000	1.0000
13	4.63	0.00	248.50	-5.00	1.0000	1.0000
14	4.63	0.00	243.50	-5.00	1.0000	1.0000
15	4.76	0.26	240.00	-2.00	1.0000	1.0000
16	5.02	0.26	236.50	-5.00	1.0000	1.0000
17	4.96	-0.36	232.50	-3.00	1.0000	1.0000
18	4.71	-0.15	232.50	3.00	1.0000	1.0000
19	4.37	-0.51	235.00	2.00	1.0000	1.0000
20	4.06	-0.10	236.50	1.00	1.0000	1.0000
21	3.81	-0.41	240.00	6.00	1.0000	1.0000
22	3.14	-0.93	248.00	10.00	1.0000	1.0000
23	2.62	-0.10	254.50	3.00	1.0000	1.0000
24	2.29	-0.57	261.00	10.00	1.0000	1.0000
25	1.72	-0.57	271.00	10.00	1.0000	1.0000
26	1.23	-0.41	280.00	8.00	1.0000	1.0000
27	1.03	0.00	283.50	-1.00	1.0000	1.0000
28	1.03	0.00	282.00	-2.00	1.0000	1.0000
29	1.29	0.51	274.00	-14.00	1.0000	1.0000
30	1.47	-0.15	266.50	-1.00	1.0000	1.0000

----- CALCULATED METEOROLOGICAL LAYER PARAMETERS -----

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
31	1.47	0.15	267.50	3.00	1.0000	1.0000
32	1.49	-0.10	281.25	24.50	1.0000	1.0000
33	1.56	0.23	308.00	29.00	1.0000	1.0000

TRANSITION LAYER NUMBER- 1

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	210.62	302.90	4.63		263.00		1.0000	1.0000
LAYER-			4.38	0.27	277.03	5.81	6.5618	5.2638
BOTTOM-	0.00	304.58	3.09		270.00		13.5102	2.9738

TRANSITION LAYER NUMBER- 2

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	2973.48	312.54	1.67		322.50		1.0000	1.0000
LAYER-			2.74	1.12	249.90	12.37	1.0000	1.0000
BOTTOM-	210.62	302.90	4.63		263.00		1.0000	1.0000

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 9
VERSION 7.05 AT KSC
1109 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 786.5 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 210.6 AND 2973.5 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
2000.000	64.400	41.073	3.717	8.908
3000.000	66.349	37.211	6.137	12.552
4000.000	67.391	32.803	9.567	16.694
5000.000	67.906	28.328	12.765	22.209
6000.000	68.167	24.329	16.269	26.745
7000.000	68.422	20.873	19.756	36.584
8000.000	68.697	17.922	23.230	55.863
9000.000	68.790	15.418	26.502	82.662
10000.000	68.911	13.280	29.704	127.531
11000.000	69.053	11.457	32.897	141.755
12000.000	68.983	9.900	36.082	155.978
13000.000	69.153	8.583	39.263	203.222
14000.686	69.333	7.454	42.442	220.330
15000.850	69.290	6.503	45.612	237.424
16000.000	69.252	5.691	48.775	254.505
17000.521	69.451	4.998	51.941	271.625
18000.625	69.422	4.412	55.101	288.729
19000.732	69.396	3.911	58.259	305.836
20000.846	69.373	3.480	61.414	322.945
21000.314	69.586	3.111	64.568	340.056
22000.371	69.567	2.795	67.720	357.168
23000.430	69.550	2.521	70.870	374.281
24000.488	69.534	2.284	74.019	391.395
25000.551	69.520	2.077	77.166	408.511
26000.613	69.506	1.895	80.313	425.627
27000.678	69.494	1.736	83.459	442.744
28000.141	69.718	1.595	86.603	459.862
29000.162	69.708	1.472	89.747	476.980
30000.186	69.698	1.362	92.890	494.099
31000.209	69.689	1.264	96.033	511.218
32000.234	69.680	1.176	99.175	528.338
33000.262	69.672	1.097	102.316	545.458
34000.285	69.665	1.025	105.457	562.578
35000.313	69.657	0.960	108.597	579.699
36000.340	69.651	0.901	111.737	596.820
37000.367	69.644	0.848	114.877	613.941
38000.395	69.638	0.799	118.016	631.063

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 10
VERSION 7.05 AT KSC
1109 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 786.5 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 210.6 AND 2973.5 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
39000.426	69.632	0.753	121.155	648.185
40000.453	69.627	0.712	124.294	665.307
41000.012	69.860	0.673	127.432	682.429
42000.012	69.855	0.638	130.570	699.551
43000.016	69.851	0.605	133.708	716.674
44000.020	69.846	0.575	136.846	733.797
45000.023	69.842	0.547	139.983	750.919
46000.027	69.838	0.520	143.120	768.042
47000.031	69.834	0.496	146.257	785.166
48000.035	69.830	0.473	149.394	802.289
49000.039	69.827	0.452	152.530	819.412
50000.043	69.823	0.431	155.667	836.536
51000.051	69.820	0.412	158.803	853.659
52000.055	69.817	0.395	161.939	870.783
53000.059	69.814	0.378	165.075	887.907
54000.066	69.811	0.362	168.211	905.031
55000.070	69.808	0.347	171.347	922.154
56000.074	69.806	0.333	174.482	939.278
57000.082	69.803	0.320	177.618	956.402
58000.086	69.800	0.308	180.754	973.526
59000.094	69.798	0.296	183.889	990.651
60000.098	69.796	0.284	187.024	1007.775

	RANGE	BEARING
41.073 IS THE MAXIMUM PEAK CONCENTRATION	2000.0	64.4

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 786.5 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 210.6 AND 2973.5 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
2000.000	64.400	10074.992	3.717	8.908
3000.000	66.349	9219.285	6.137	12.552
4000.000	67.391	8278.110	9.567	16.694
5000.000	67.906	7332.461	12.765	22.209
6000.000	68.167	6498.502	16.269	26.745
7000.000	68.422	5784.840	19.756	36.584
8000.000	68.697	5176.151	23.230	55.863
9000.000	68.790	4655.458	26.502	82.662
10000.000	68.911	4201.880	29.704	127.531
11000.000	69.053	3803.871	32.897	141.755
12000.000	68.983	3451.903	36.082	155.978
13000.000	69.153	3143.458	39.263	203.222
14000.686	69.333	2866.650	42.442	220.330
15000.850	69.290	2624.609	45.612	237.424
16000.000	69.252	2408.261	48.775	254.505
17000.521	69.451	2215.850	51.941	271.625
18000.625	69.422	2046.688	55.101	288.729
19000.732	69.396	1895.763	58.259	305.836
20000.846	69.373	1761.150	61.414	322.945
21000.314	69.586	1641.085	64.568	340.056
22000.371	69.567	1535.322	67.720	357.168
23000.430	69.550	1440.590	70.870	374.281
24000.488	69.534	1355.593	74.019	391.395
25000.551	69.520	1279.173	77.166	408.511
26000.613	69.506	1210.297	80.313	425.627
27000.678	69.494	1148.055	83.459	442.744
28000.141	69.718	1091.303	86.603	459.862
29000.162	69.708	1040.606	89.747	476.980
30000.186	69.698	994.327	92.890	494.099
31000.209	69.689	951.942	96.033	511.218
32000.234	69.680	912.992	99.175	528.338
33000.262	69.672	877.081	102.316	545.458
34000.285	69.665	843.860	105.457	562.578
35000.313	69.657	813.029	108.597	579.699
36000.340	69.651	784.326	111.737	596.820
37000.367	69.644	757.523	114.877	613.941
38000.395	69.638	732.422	118.016	631.063

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 12
VERSION 7.05 AT KSC
1109 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 786.5 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 210.6 AND 2973.5 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
39000.426	69.632	708.852	121.155	648.185
40000.453	69.627	686.662	124.294	665.307
41000.012	69.860	664.842	127.432	682.429
42000.012	69.855	645.223	130.570	699.551
43000.016	69.851	626.623	133.708	716.674
44000.020	69.846	608.953	136.846	733.797
45000.023	69.842	592.140	139.983	750.919
46000.027	69.838	576.116	143.120	768.042
47000.031	69.834	560.821	146.257	785.166
48000.035	69.830	546.203	149.394	802.289
49000.039	69.827	532.214	152.530	819.412
50000.043	69.823	518.812	155.667	836.536
51000.051	69.820	505.960	158.803	853.659
52000.055	69.817	493.622	161.939	870.783
53000.059	69.814	481.768	165.075	887.907
54000.066	69.811	470.370	168.211	905.031
55000.070	69.808	459.402	171.347	922.154
56000.074	69.806	448.840	174.482	939.278
57000.082	69.803	438.664	177.618	956.402
58000.086	69.800	428.853	180.754	973.526
59000.094	69.798	419.389	183.889	990.651
60000.098	69.796	410.254	187.024	1007.775

RANGE	BEARING
2000.0	64.4

10074.992 IS THE MAXIMUM TOTAL DOSAGE

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 786.5 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 210.6 AND 2973.5 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	30.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
2000.000	64.400	5.597	3.717	8.908
3000.000	66.349	5.122	6.137	12.552
4000.000	67.391	4.599	9.567	16.694
5000.000	67.906	4.074	12.765	22.209
6000.000	68.167	3.610	16.269	26.745
7000.000	68.422	3.214	19.756	36.584
8000.000	68.697	2.876	23.230	55.863
9000.000	68.790	2.586	26.502	82.662
10000.000	68.911	2.334	29.704	127.531
11000.000	69.053	2.113	32.897	141.755
12000.000	68.983	1.918	36.082	155.978
13000.000	69.153	1.746	39.263	203.222
14000.686	69.333	1.593	42.442	220.330
15000.850	69.290	1.458	45.612	237.424
16000.000	69.252	1.338	48.775	254.505
17000.521	69.451	1.231	51.941	271.625
18000.625	69.422	1.137	55.101	288.729
19000.732	69.396	1.053	58.259	305.836
20000.846	69.373	0.978	61.414	322.945
21000.314	69.586	0.912	64.568	340.056
22000.371	69.567	0.853	67.720	357.168
23000.430	69.550	0.800	70.870	374.281
24000.488	69.534	0.753	74.019	391.395
25000.551	69.520	0.710	77.166	408.511
26000.613	69.506	0.672	80.313	425.627
27000.678	69.494	0.637	83.459	442.744
28000.141	69.718	0.606	86.603	459.862
29000.162	69.708	0.577	89.747	476.980
30000.186	69.698	0.551	92.890	494.099
31000.209	69.689	0.527	96.033	511.218
32000.234	69.680	0.505	99.175	528.338
33000.262	69.672	0.485	102.316	545.458
34000.285	69.665	0.466	105.457	562.578
35000.313	69.657	0.448	108.597	579.699
36000.340	69.651	0.432	111.737	596.820
37000.367	69.644	0.416	114.877	613.941

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 14
VERSION 7.05 AT KSC
1109 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 786.5 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 210.6 AND 2973.5 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	30.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
38000.395	69.638	0.401	118.016	631.063
39000.426	69.632	0.387	121.155	648.185
40000.453	69.627	0.374	124.294	665.307
41000.012	69.860	0.361	127.432	682.429
42000.012	69.855	0.349	130.570	699.551
43000.016	69.851	0.338	133.708	716.674
44000.020	69.846	0.327	136.846	733.797
45000.023	69.842	0.317	139.983	750.919
46000.027	69.838	0.307	143.120	768.042
47000.031	69.834	0.297	146.257	785.166
48000.035	69.830	0.288	149.394	802.289
49000.039	69.827	0.279	152.530	819.412
50000.043	69.823	0.271	155.667	836.536
51000.051	69.820	0.263	158.803	853.659
52000.055	69.817	0.255	161.939	870.783
53000.059	69.814	0.247	165.075	887.907
54000.066	69.811	0.240	168.211	905.031
55000.070	69.808	0.233	171.347	922.154
56000.074	69.806	0.226	174.482	939.278
57000.082	69.803	0.219	177.618	956.402
58000.086	69.800	0.213	180.754	973.526
59000.094	69.798	0.207	183.889	990.651
60000.098	69.796	0.201	187.024	1007.775

	RANGE	BEARING
5.597 IS THE MAXIMUM 30.0 MIN. MEAN CONCENTRATION	2000.0	64.4

*** REEDM HAS TERMINATED

2. Ground-Level HCl Exposure Doses Calculated from T–0.3 h Rawinsonde Data

----- PROGRAM OPTIONS -----

MODEL		CONCENTRATION
RUN TYPE		OPERATIONAL
WIND-FIELD TERRAIN EFFECTS MODEL		NONE
LAUNCH VEHICLE		TITAN IV
LAUNCH TYPE		NORMAL
LAUNCH COMPLEX NUMBER		40
TURBULENCE PARAMETERS ARE DETERMINED FROM		CLIMATOLOGICAL DATA
SPECIES		HCL
CLOUD SHAPE		ELLIPTICAL
CALCULATION HEIGHT		SURFACE
PROPELLANT TEMPERATURE (DEG. C)		25.74
CONCENTRATION AVERAGING TIME (SEC.)		1800.00
DECAY COEFFICIENT		0.0000
ABSORPTION COEFFICIENT (RNG- 0 TO 1,NO ABSORPTION=0)		0.0000
DIFFUSION COEFFICIENTS	LATERAL	1.0000
	VERTICAL	1.0000
VEHICLE AIR ENTRAINMENT PARAMETER	GAMMAE	0.6400
DOWNWIND EXPANSION DISTANCE (METERS)	LATERAL	100.00
	VERTICAL	100.00

----- DATA FILES -----

INPUT FILES

RAWINSONDE FILE	k23_1327.raw
DATA BASE FILE	rdmbase.ksc

OUTPUT FILES

PRINT FILE	k23d1327.sur
PLOT FILE	k23d1327.u_p

----- METEOROLOGICAL RAWINSONDE DATA -----

RAWINSONDE MSS/MSS
TIME- 1327 Z DATE- 14 MAY 95
ASCENT NUMBER 0

----- T -0.3 HR SOUNDING -----

MET. LEV. NO.	ALTITUDE MSL (FT)	ALTITUDE GND (FT)	GND (M)	WIND DIR (DEG)	WIND SPEED (M/S)	WIND SPEED (KTS)	AIR TEMP (DEG C)	AIR PTEMP (DEG C)	AIR DPTEMP (DEG C)	AIR PRESS (MB)	AIR RH (%)	H M	INT-ERP
1	16	0.0	0.0	270	3.1	6.0	29.5	31.4	23.9	1016.7	72.0		
2	67	51.3	15.6	275	3.5	6.7	28.8	30.7	23.5	1014.9	73.1		**
3	119	102.5	31.2	280	3.9	7.5	28.0	30.1	23.0	1013.1	74.3		**
4	170	153.8	46.9	284	4.2	8.2	27.3	29.4	22.5	1011.4	75.5		**
5	221	205.0	62.5	289	4.6	9.0	26.5	28.7	22.1	1009.6	77.0		
6	314	297.7	90.7	284	4.6	9.0	26.3	28.9	22.4	1006.4	79.2		**
7	406	390.3	119.0	279	4.6	9.0	26.2	29.1	22.8	1003.2	81.6		**
8	499	483.0	147.2	274	4.6	9.0	26.0	29.2	23.1	1000.0	84.0		
9	603	587.0	178.9	269	4.6	9.0	25.9	29.5	23.5	996.4	86.9		**
10	707	691.0	210.6	263	4.6	9.0	25.7	29.8	23.9	992.9	90.0	*	
11	854	837.5	255.3	260	4.6	8.9	25.9	30.3	23.2	987.9	85.1		**
12	1000	984.0	299.9	256	4.5	8.8	26.1	30.8	22.5	983.0	81.0		
13	1253	1237.0	377.0	251	4.6	9.0	26.4	31.6	21.2	974.4	73.0		
14	1524	1508.0	459.6	246	4.6	9.0	26.0	32.1	20.9	965.4	73.2		**
15	1795	1779.0	542.2	241	4.6	9.0	25.7	32.5	20.5	956.4	73.0		
16	2000	1984.0	604.7	239	4.9	9.5	25.2	32.5	20.1	949.7	73.0		
17	2349	2333.0	711.1	234	5.1	10.0	24.4	32.7	19.4	938.3	74.0		
18	3000	2984.0	909.5	231	4.8	9.3	22.8	32.9	18.2	917.4	75.0		
19	3542	3526.0	1074.7	234	4.6	9.0	21.3	33.0	17.6	900.0	80.0		
20	3921	3905.0	1190.2	236	4.1	8.0	20.4	33.2	17.3	888.3	83.0		
21	4000	3984.0	1214.3	237	4.0	7.8	20.2	33.2	17.2	885.8	83.0		
22	4462	4446.0	1355.1	243	3.6	7.0	19.2	33.5	16.7	871.6	85.0		
23	5000	4984.0	1519.1	253	2.7	5.2	18.3	34.0	14.8	855.2	80.0		
24	5163	5147.0	1568.8	256	2.6	5.0	18.2	34.4	14.2	850.0	78.0		
25	5582	5565.5	1696.4	266	2.0	3.9	17.6	35.0	13.0	837.6	74.6		**
26	6000	5984.0	1823.9	276	1.4	2.8	17.1	35.6	11.8	825.4	71.0		
27	6863	6847.0	2087.0	284	1.0	2.0	15.7	36.2	4.9	800.0	50.0		
28	7000	6984.0	2128.7	283	1.0	2.0	15.5	36.2	3.2	796.4	45.0		
29	7259	7243.0	2207.7	281	1.0	2.0	15.0	36.2	-0.5	789.1	35.0		
30	7839	7823.0	2384.5	267	1.5	3.0	13.4	36.8	5.1	772.8	57.0		
31	8000	7984.0	2433.5	266	1.4	2.7	13.2	37.0	4.2	768.3	54.0		
32	8650	8634.0	2631.6	269	1.5	3.0	12.1	37.9	2.3	750.0	51.0		
33	9272	9255.5	2821.1	294	1.4	2.8	11.0	38.7	2.7	733.6	57.5		**
34	9772	9755.5	2973.5	323	1.7	3.2	10.4	39.4	-1.0	720.4	46.5		**

* - INDICATES THE CALCULATED TOP OF THE SURFACE MIXING LAYER
** - INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 4
VERSION 7.05 AT KSC
1334 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

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----- METEOROLOGICAL RAWINSONDE DATA -----

SURFACE AIR DENSITY (GM/M**3)	1157.37
DEFAULT CALCULATED MIXING LAYER HEIGHT (M)	210.62
CLOUD COVER IN TENTHS OF CELESTIAL DOME	0.0
CLOUD CEILING (M)	9999.0

----- PLUME RISE DATA -----

EXHAUST RATE OF MATERIAL-	(GRAMS/SEC)		4.22354E+06
TOTAL MATERIAL OUTPUT-	(GRAMS)		5.36146E+08
HEAT OUTPUT PER GRAM-	(CALORIES)		1555.5800
VEHICLE RISE TIME PARAMETERS-	(TK=(A*Z**B)+C)	A=	0.8678
		B=	0.4500
		C=	0.0000

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)	CLOUD RISE TIME (SECONDS)	CLOUD RISE RANGE (METERS)	CLOUD RISE BEARING (DEGREES)	STABILIZED CLOUD RANGE (METERS)	STABILIZED CLOUD BEARING (DEGREES)
1	15.6	2.8	4.4	91.3	0.0	0.0
2	31.2	4.4	12.0	93.4	0.0	0.0
3	46.9	6.0	18.1	95.5	0.0	0.0
4	62.5	7.6	24.8	97.9	0.0	0.0
5	90.7	10.7	35.6	100.9	0.0	0.0
6	119.0	14.2	50.9	101.8	0.0	0.0
7	147.2	18.1	68.0	101.1	0.0	0.0
8	178.9	23.0	88.1	99.4	0.0	0.0
9	210.6	28.4	111.5	97.1	0.0	0.0
10	255.3	36.8	142.8	94.0	0.0	0.0
11	299.9	46.3	182.7	90.7	0.0	0.0
12	377.0	64.7	244.3	86.8	1373.4	75.9
13	459.6	87.9	337.7	82.3	1370.1	71.9
14	542.2	115.8	452.4	78.1	1353.1	68.3
15	604.7	141.5	573.1	74.5	1375.9	66.0
16	711.1	201.3	776.7	70.2	1325.3	64.5
17	909.5	312.5 *	1477.7	62.3	1477.7	62.3
18	1074.7	312.5 *	1477.7	62.3	1477.7	62.3
19	1190.2	312.5 *	1477.7	62.3	1477.7	62.3
20	1214.3	312.5 *	1477.7	62.3	1477.7	62.3
21	1355.1	312.5 *	1477.7	62.3	1477.7	62.3
22	1519.1	312.5 *	1477.7	62.3	1477.7	62.3
23	1568.8	312.5 *	1477.7	62.3	1477.7	62.3
24	1696.4	312.5 *	1477.7	62.3	1477.7	62.3
25	1823.9	312.5 *	1477.7	62.3	1477.7	62.3
26	2087.0	312.5 *	1477.7	62.3	1477.7	62.3
27	2128.7	312.5 *	1477.7	62.3	1477.7	62.3
28	2207.7	312.5 *	1477.7	62.3	1477.7	62.3
29	2384.5	312.5 *	1477.7	62.3	1477.7	62.3
30	2433.5	312.5 *	1477.7	62.3	1477.7	62.3
31	2631.6	312.5 *	1477.7	62.3	1477.7	62.3
32	2821.1	312.5 *	1477.7	62.3	1477.7	62.3
33	2973.5	312.5 *	1477.7	62.3	1477.7	62.3

* - INDICATES CLOUD STABILIZATION TIME WAS USED

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VERSION 7.05 AT KSC
1334 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1327 Z 14 MAY 95 T -0.3 HR

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----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)		LAYER SOURCE STRENGTH (GRAMS)	CLOUD UPDRAFT VELOCITY (M/S)	CLOUD RADIUS (METERS)	STD. DEVIATION MATERIAL DIST. ALONGWIND (METERS)	CROSSWIND (METERS)
1	15.6		0.00000E+00	8.9	0.0	0.0	0.0
2	31.2		0.00000E+00	10.0	0.0	0.0	0.0
3	46.9		0.00000E+00	9.9	0.0	0.0	0.0
4	62.5		0.00000E+00	9.5	0.0	0.0	0.0
5	90.7		0.00000E+00	8.5	0.0	0.0	0.0
6	119.0		0.00000E+00	7.7	0.0	0.0	0.0
7	147.2		0.00000E+00	6.9	0.0	0.0	0.0
8	178.9		0.00000E+00	6.2	0.0	0.0	0.0
9	210.6		0.00000E+00	5.6	0.0	0.0	0.0
10	255.3		0.00000E+00	5.0	0.0	0.0	0.0
11	299.9		0.00000E+00	4.5	0.0	0.0	0.0
12	377.0		1.72709E+06	3.9	360.0	167.7	167.7
13	459.6		4.18738E+06	3.3	441.3	205.6	205.6
14	542.2		6.12597E+06	2.7	498.7	232.4	232.4
15	604.7		5.62284E+06	2.2	533.8	248.7	248.7
16	711.1		1.08773E+07	1.4	560.1	261.0	261.0
17	909.5	*	2.64416E+07	0.0	574.2	267.6	267.6
18	1074.7	*	2.10760E+07	0.0	536.6	250.1	250.1
19	1190.2	*	1.06041E+07	0.0	458.8	213.8	213.8
20	1214.3	*	1.63772E+06	0.0	396.7	184.8	184.8
21	1355.1	*	4.69957E+06	0.0	286.3	133.4	133.4
22	1519.1	*	4.96034E+06	0.0	199.9	93.2	93.2
23	1568.8	*	1.44412E+06	0.0	199.9	93.2	93.2
24	1696.4	*	3.59631E+06	0.0	199.9	93.2	93.2
25	1823.9	*	3.45042E+06	0.0	199.9	93.2	93.2
26	2087.0	*	6.71817E+06	0.0	199.9	93.2	93.2
27	2128.7	*	1.02273E+06	0.0	199.9	93.2	93.2
28	2207.7	*	1.90376E+06	0.0	199.9	93.2	93.2
29	2384.5	*	4.13163E+06	0.0	199.9	93.2	93.2
30	2433.5	*	1.11677E+06	0.0	199.9	93.2	93.2
31	2631.6	*	4.38722E+06	0.0	199.9	93.2	93.2
32	2821.1	*	4.02796E+06	0.0	199.9	93.2	93.2
33	2973.5	*	3.13370E+06	0.0	199.9	93.2	93.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- CLOUD STABILIZATION -----

CALCULATION HEIGHT	(METERS)	0.00
STABILIZATION HEIGHT	(METERS)	786.45
STABILIZATION TIME	(SECS)	312.48
FIRST MIXING LAYER HEIGHT-	(METERS)	TOP = 210.62
		BASE= 0.00
SECOND SELECTED LAYER HEIGHT-	(METERS)	TOP = 2973.48
		BASE= 210.62
SIGMAR(AZ) AT THE SURFACE	(DEGREES)	13.5102
SIGMER(EL) AT THE SURFACE	(DEGREES)	2.9738

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
1	3.36	0.39	272.38	4.75	11.5724	4.0633
2	3.67	0.39	277.13	4.75	9.2409	5.5360
3	4.05	0.39	281.88	4.75	8.6320	6.1691
4	4.44	0.39	286.63	4.75	8.2705	6.6091
5	4.63	0.00	286.50	-5.00	7.9421	7.0625
6	4.63	0.00	281.50	-5.00	6.9934	6.6960
7	4.63	0.00	276.50	-5.00	6.1181	5.9631
8	4.63	0.00	271.25	-5.50	4.4578	4.3832
9	4.63	0.00	265.75	-5.50	1.9531	1.9531
10	4.60	-0.05	261.25	-3.50	1.0000	1.0000
11	4.55	-0.05	257.75	-3.50	1.0000	1.0000
12	4.58	0.10	253.50	-5.00	1.0000	1.0000
13	4.63	0.00	248.50	-5.00	1.0000	1.0000
14	4.63	0.00	243.50	-5.00	1.0000	1.0000
15	4.76	0.26	240.00	-2.00	1.0000	1.0000
16	5.02	0.26	236.50	-5.00	1.0000	1.0000
17	4.96	-0.36	232.50	-3.00	1.0000	1.0000
18	4.71	-0.15	232.50	3.00	1.0000	1.0000
19	4.37	-0.51	235.00	2.00	1.0000	1.0000
20	4.06	-0.10	236.50	1.00	1.0000	1.0000
21	3.81	-0.41	240.00	6.00	1.0000	1.0000
22	3.14	-0.93	248.00	10.00	1.0000	1.0000
23	2.62	-0.10	254.50	3.00	1.0000	1.0000
24	2.29	-0.57	261.00	10.00	1.0000	1.0000
25	1.72	-0.57	271.00	10.00	1.0000	1.0000
26	1.23	-0.41	280.00	8.00	1.0000	1.0000
27	1.03	0.00	283.50	-1.00	1.0000	1.0000
28	1.03	0.00	282.00	-2.00	1.0000	1.0000
29	1.29	0.51	274.00	-14.00	1.0000	1.0000
30	1.47	-0.15	266.50	-1.00	1.0000	1.0000

----- CALCULATED METEOROLOGICAL LAYER PARAMETERS -----

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
31	1.47	0.15	267.50	3.00	1.0000	1.0000
32	1.49	-0.10	281.25	24.50	1.0000	1.0000
33	1.56	0.23	308.00	29.00	1.0000	1.0000

TRANSITION LAYER NUMBER- 1

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	210.62	302.90	4.63		263.00		1.0000	1.0000
LAYER-			4.38	0.27	277.03	5.81	6.5618	5.2638
BOTTOM-	0.00	304.58	3.09		270.00		13.5102	2.9738

TRANSITION LAYER NUMBER- 2

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	2973.48	312.54	1.67		322.50		1.0000	1.0000
LAYER-			2.74	1.12	249.90	12.37	1.0000	1.0000
BOTTOM-	210.62	302.90	4.63		263.00		1.0000	1.0000

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VERSION 7.05 AT KSC
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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 210.6 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)

** NO HCL FOUND **

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 210.6 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)

** NO HCL FOUND **

3. Cloud Stabilization Heights Calculated from T–1.4 h Rawinsonde Data

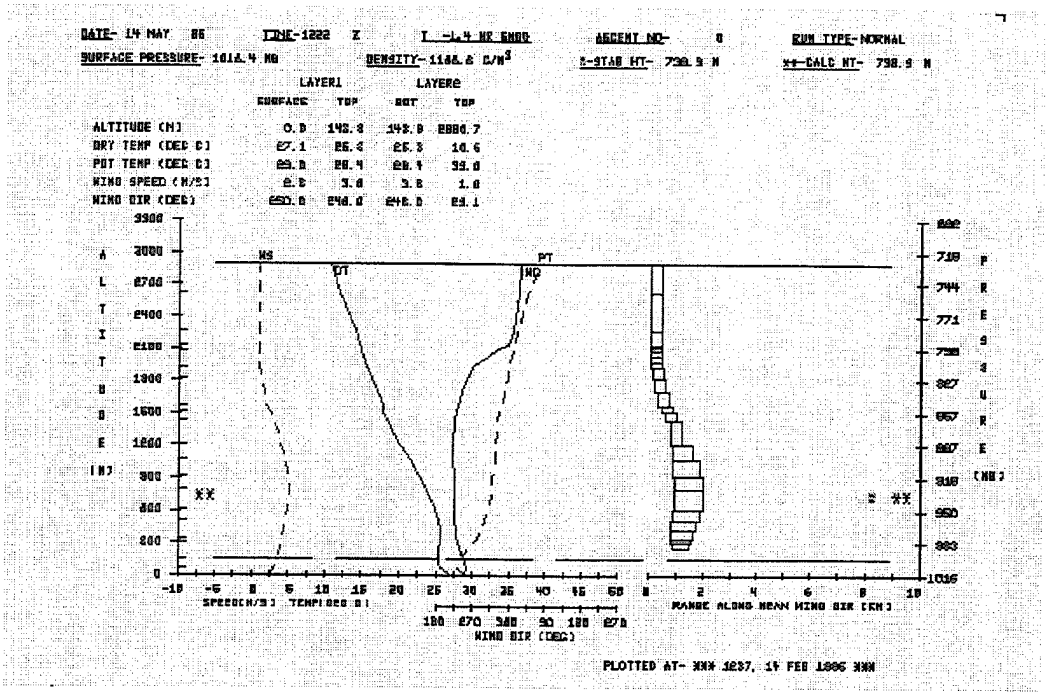

Figure C-4: Meteorological Data for 1222 Rawinsonde Sounding (K-23 Launch : -1.4 HR)

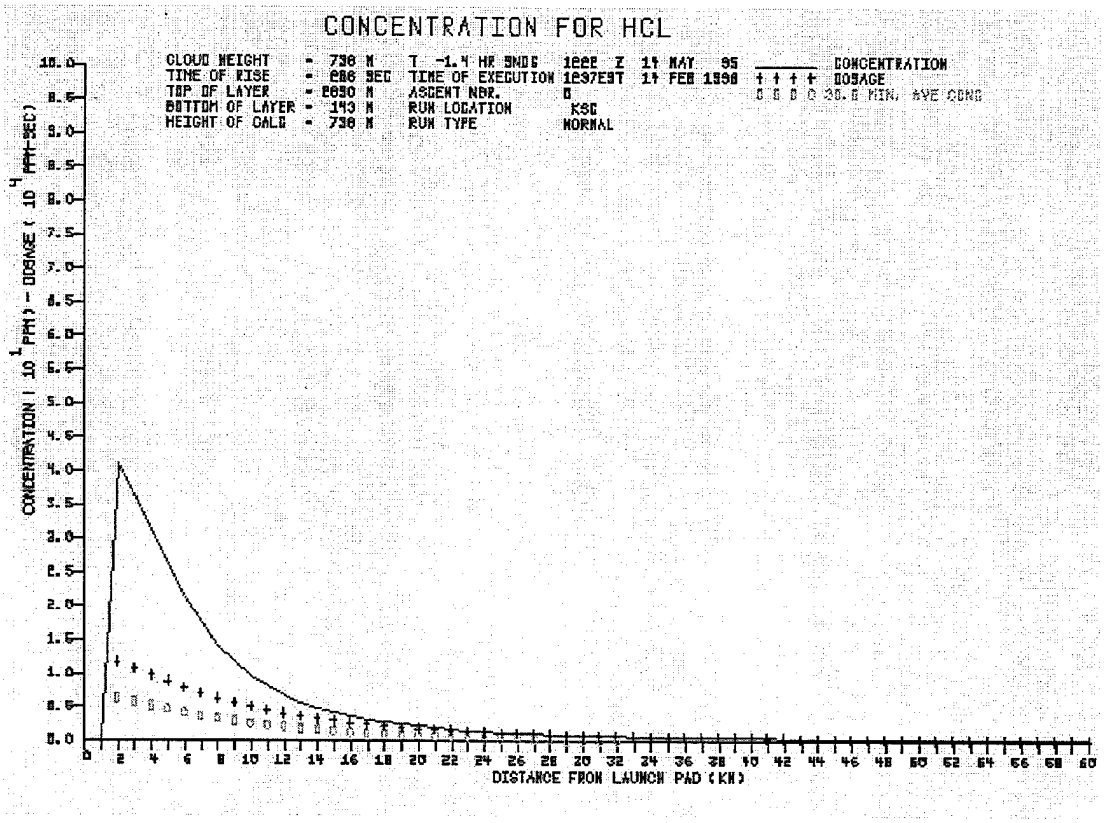

Figure C-5: REEDM's Predictions for the Stabilized Launch Cloud using 1222 Rawinsonde Data (K-23 Launch: -1.4 HR)

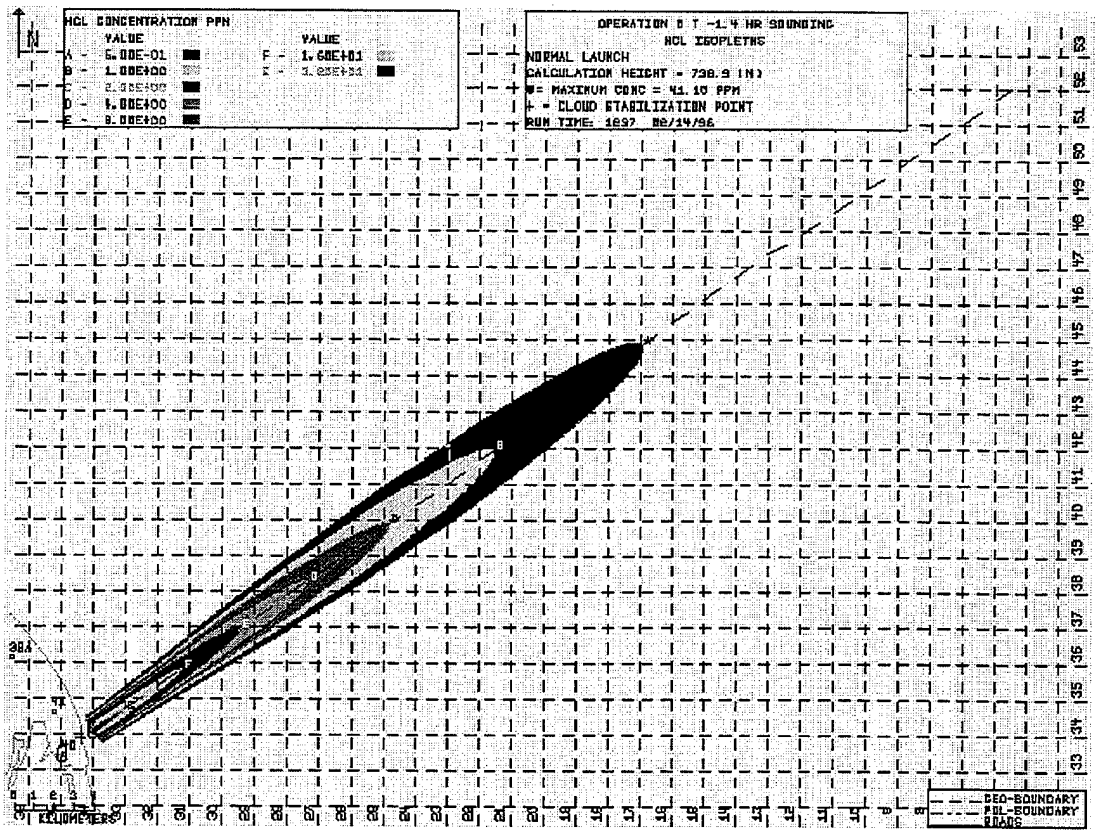

Figure C-6: REEDM HCL Concentration Isopleths for the Stabilized Launch Cloud using 1222 Rawinsonde Data (K-23 Launch: -1.4 HR).

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 3
VERSION 7.05 AT KSC
1237 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1222 Z 14 MAY 95 T -1.4 HR

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----- PROGRAM OPTIONS -----

MODEL		CONCENTRATION
RUN TYPE		OPERATIONAL
WIND-FIELD TERRAIN EFFECTS MODEL		NONE
LAUNCH VEHICLE		TITAN IV
LAUNCH TYPE		NORMAL
LAUNCH COMPLEX NUMBER		40
TURBULENCE PARAMETERS ARE DETERMINED FROM		CLIMATOLOGICAL DATA
SPECIES		HCL
CLOUD SHAPE		ELLIPTICAL
CALCULATION HEIGHT		STABILIZATION
PROPELLANT TEMPERATURE (DEG. C)		25.74
CONCENTRATION AVERAGING TIME (SEC.)		1800.00
DECAY COEFFICIENT		0.0000
ABSORPTION COEFFICIENT (RNG- 0 TO 1,NO ABSORPTION=0)		0.0000
DIFFUSION COEFFICIENTS	LATERAL	1.0000
	VERTICAL	1.0000
VEHICLE AIR ENTRAINMENT PARAMETER	GAMMAE	0.6400
DOWNWIND EXPANSION DISTANCE (METERS)	LATERAL	100.00
	VERTICAL	100.00

----- DATA FILES -----

INPUT FILES

RAWINSONDE FILE	k23_1222.raw
DATA BASE FILE	rdmbase.ksc

OUTPUT FILES

PRINT FILE	k23d1222.stb
PLOT FILE	k23d1222.s_p

----- METEOROLOGICAL RAWINSONDE DATA -----

RAWINSONDE MSS/MSS
TIME- 1222 Z DATE- 14 MAY 95
ASCENT NUMBER 0

----- T -1.4 HR SOUNDING -----

MET. LEV. NO.	ALTITUDE MSL (FT)	ALTITUDE GND (FT)	WIND GND (M)	WIND DIR (DEG)	WIND SPEED (M/S)	WIND SPEED (KTS)	AIR TEMP (DEG C)	AIR PTEMP (DEG C)	AIR DPTEMP (DEG C)	AIR PRESS (MB)	AIR RH (%)	H M	INTERP
1	16	0.0	0.0	250	2.6	5.0	27.1	29.0	23.6	1016.4	81.0		
2	63	46.8	14.3	251	2.7	5.2	26.8	28.8	23.4	1014.8	81.9		**
3	110	93.6	28.5	253	2.8	5.4	26.5	28.6	23.2	1013.2	82.5		**
4	156	140.4	42.8	254	2.9	5.6	26.1	28.3	23.1	1011.5	83.2		**
5	203	187.2	57.1	256	3.0	5.8	25.8	28.1	22.9	1009.9	83.8		**
6	250	234.0	71.3	257	3.1	6.0	25.5	27.9	22.7	1008.3	84.0		
7	329	313.3	95.5	253	3.3	6.3	25.4	28.1	22.6	1005.5	84.5		**
8	409	392.7	119.7	250	3.4	6.7	25.4	28.2	22.6	1002.8	84.5		**
9	488	472.0	143.9	246	3.6	7.0	25.3	28.4	22.5	1000.0	85.0	*	
10	659	642.7	195.9	242	3.8	7.3	25.4	29.0	22.3	994.1	83.2		**
11	829	813.3	247.9	237	3.9	7.7	25.4	29.5	22.1	988.3	81.9		**
12	1000	984.0	299.9	233	4.1	8.0	25.5	30.1	21.9	982.5	81.0		
13	1142	1126.0	343.2	231	4.1	8.0	25.7	30.7	21.6	977.8	78.0		
14	1414	1398.0	426.1	229	4.4	8.5	25.5	31.2	20.9	968.7	75.4		**
15	1686	1670.0	509.0	227	4.6	9.0	25.4	31.8	20.1	959.6	72.0		
16	2000	1984.0	604.7	225	5.0	9.7	24.8	32.1	19.8	949.3	74.0		
17	2606	2590.0	789.4	225	5.1	10.0	23.7	32.7	18.9	929.6	75.0		
18	3000	2984.0	909.5	225	5.0	9.7	22.6	32.8	18.4	916.9	77.0		
19	3528	3512.0	1070.5	223	4.6	9.0	21.4	33.1	17.9	900.0	81.0		
20	4000	3984.0	1214.3	223	4.0	7.8	20.1	33.2	17.5	885.4	85.0		
21	4717	4701.0	1432.9	226	3.1	6.0	18.2	33.3	16.5	863.3	90.0		
22	5000	4984.0	1519.1	230	2.5	4.8	17.9	33.7	15.3	854.7	85.0		
23	5147	5131.0	1563.9	233	2.1	4.0	17.7	33.9	14.7	850.0	83.0		
24	5574	5557.5	1693.9	245	1.6	3.2	17.0	34.3	13.2	837.3	78.6		**
25	6000	5984.0	1823.9	256	1.2	2.4	16.3	34.7	11.7	824.9	74.0		
26	6323	6307.0	1922.4	269	1.0	2.0	15.5	34.8	10.8	815.4	74.0		
27	6497	6480.7	1975.3	289	1.0	2.0	15.3	35.1	9.6	810.2	69.1		**
28	6670	6654.3	2028.2	308	1.0	2.0	15.1	35.3	8.3	805.1	64.5		**
29	6844	6828.0	2081.2	328	1.0	1.9	14.9	35.5	7.1	800.0	59.0		
30	6922	6906.0	2104.9	342	1.0	1.9	14.8	35.5	6.2	797.9	57.0		**
31	7000	6984.0	2128.7	357	1.0	1.9	14.7	35.6	5.3	795.9	54.0		
32	7427	7411.0	2258.9	11	1.0	1.9	14.2	36.0	-0.3	783.8	37.0		
33	8628	8612.0	2624.9	22	1.0	1.9	11.9	37.6	1.6	750.0	49.0		
34	9500	9484.0	2890.7	29	1.0	1.9	10.6	39.0	0.8	727.0	51.5		**

* - INDICATES THE CALCULATED TOP OF THE SURFACE MIXING LAYER
** - INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

----- METEOROLOGICAL RAWINSONDE DATA -----

SURFACE AIR DENSITY (GM/M**3)	1166.55
DEFAULT CALCULATED MIXING LAYER HEIGHT (M)	143.87
CLOUD COVER IN TENTHS OF CELESTIAL DOME	0.0
CLOUD CEILING (M)	9999.0

----- PLUME RISE DATA -----

EXHAUST RATE OF MATERIAL-	(GRAMS/SEC)		4.22354E+06
TOTAL MATERIAL OUTPUT-	(GRAMS)		5.36146E+08
HEAT OUTPUT PER GRAM-	(CALORIES)		1555.5800
VEHICLE RISE TIME PARAMETERS-	(TK=(A*Z**B)+C)	A=	0.8678
		B=	0.4500
		C=	0.0000

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VERSION 7.05 AT KSC
1237 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1222 Z 14 MAY 95 T -1.4 HR

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----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)	CLOUD RISE TIME (SECONDS)		CLOUD RISE RANGE (METERS)	CLOUD RISE BEARING (DEGREES)	STABILIZED CLOUD RANGE (METERS)	STABILIZED CLOUD BEARING (DEGREES)
1	14.3	2.6		3.4	70.4	0.0	0.0
2	28.5	4.1		8.9	71.0	0.0	0.0
3	42.8	5.6		13.0	71.5	0.0	0.0
4	57.1	7.0		17.2	72.2	0.0	0.0
5	71.3	8.5		21.6	72.9	0.0	0.0
6	95.5	11.3		28.2	73.7	0.0	0.0
7	119.7	14.3		37.6	73.6	0.0	0.0
8	143.9	17.6		48.5	72.7	0.0	0.0
9	195.9	25.9		69.3	70.5	0.0	0.0
10	247.9	35.5		102.7	67.6	0.0	0.0
11	299.9	46.5		142.9	64.6	1109.9	56.4
12	343.2	56.7		185.5	62.0	1130.6	53.6
13	426.1	79.0		252.3	59.0	1132.0	52.0
14	509.0	106.1		359.3	56.0	1170.6	50.4
15	604.7	146.9		516.0	53.2	1187.1	49.1
16	789.4	286.9	*	1319.1	48.2	1319.1	48.2
17	909.5	286.9	*	1319.1	48.2	1319.1	48.2
18	1070.5	286.9	*	1319.1	48.2	1319.1	48.2
19	1214.3	286.9	*	1319.1	48.2	1319.1	48.2
20	1432.9	286.9	*	1319.1	48.2	1319.1	48.2
21	1519.1	286.9	*	1319.1	48.2	1319.1	48.2
22	1563.9	286.9	*	1319.1	48.2	1319.1	48.2
23	1693.9	286.9	*	1319.1	48.2	1319.1	48.2
24	1823.9	286.9	*	1319.1	48.2	1319.1	48.2
25	1922.4	286.9	*	1319.1	48.2	1319.1	48.2
26	1975.3	286.9	*	1319.1	48.2	1319.1	48.2
27	2028.2	286.9	*	1319.1	48.2	1319.1	48.2
28	2081.2	286.9	*	1319.1	48.2	1319.1	48.2
29	2104.9	286.9	*	1319.1	48.2	1319.1	48.2
30	2128.7	286.9	*	1319.1	48.2	1319.1	48.2
31	2258.9	286.9	*	1319.1	48.2	1319.1	48.2
32	2624.9	286.9	*	1319.1	48.2	1319.1	48.2
33	2890.7	286.9	*	1319.1	48.2	1319.1	48.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)		LAYER SOURCE STRENGTH (GRAMS)	CLOUD UPDRAFT VELOCITY (M/S)	CLOUD RADIUS (METERS)	STD. DEVIATION MATERIAL DIST. ALONGWIND (METERS)	CROSSWIND (METERS)
1	14.3		0.00000E+00	8.6	0.0	0.0	0.0
2	28.5		0.00000E+00	9.9	0.0	0.0	0.0
3	42.8		0.00000E+00	10.0	0.0	0.0	0.0
4	57.1		0.00000E+00	9.6	0.0	0.0	0.0
5	71.3		0.00000E+00	9.2	0.0	0.0	0.0
6	95.5		0.00000E+00	8.4	0.0	0.0	0.0
7	119.7		0.00000E+00	7.6	0.0	0.0	0.0
8	143.9		0.00000E+00	7.0	0.0	0.0	0.0
9	195.9		0.00000E+00	5.8	0.0	0.0	0.0
10	247.9		0.00000E+00	5.0	0.0	0.0	0.0
11	299.9		1.74718E+05	4.5	282.8	131.8	131.8
12	343.2		1.07451E+06	4.0	349.4	162.8	162.8
13	426.1		4.09799E+06	3.4	413.2	192.5	192.5
14	509.0		6.28986E+06	2.7	471.8	219.8	219.8
15	604.7		9.22714E+06	2.0	512.9	239.0	239.0
16	789.4	*	2.27301E+07	0.0	542.6	252.9	252.9
17	909.5	*	1.76831E+07	0.0	532.9	248.3	248.3
18	1070.5	*	1.89259E+07	0.0	482.9	225.0	225.0
19	1214.3	*	9.22771E+06	0.0	365.2	170.2	170.2
20	1432.9	*	6.92036E+06	0.0	199.9	93.2	93.2
21	1519.1	*	2.57035E+06	0.0	199.9	93.2	93.2
22	1563.9	*	1.30349E+06	0.0	199.9	93.2	93.2
23	1693.9	*	3.66961E+06	0.0	199.9	93.2	93.2
24	1823.9	*	3.51775E+06	0.0	199.9	93.2	93.2
25	1922.4	*	2.57322E+06	0.0	199.9	93.2	93.2
26	1975.3	*	1.35362E+06	0.0	199.9	93.2	93.2
27	2028.2	*	1.33381E+06	0.0	199.9	93.2	93.2
28	2081.2	*	1.31480E+06	0.0	199.9	93.2	93.2
29	2104.9	*	5.84536E+05	0.0	199.9	93.2	93.2
30	2128.7	*	5.80916E+05	0.0	199.9	93.2	93.2
31	2258.9	*	3.11866E+06	0.0	199.9	93.2	93.2
32	2624.9	*	8.27526E+06	0.0	199.9	93.2	93.2
33	2890.7	*	5.61678E+06	0.0	199.9	93.2	93.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

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----- CLOUD STABILIZATION -----

CALCULATION HEIGHT	(METERS)	738.90
STABILIZATION HEIGHT	(METERS)	738.90
STABILIZATION TIME	(SECS)	286.88
FIRST MIXING LAYER HEIGHT-	(METERS)	TOP = 143.87
		BASE= 0.00
SECOND SELECTED LAYER HEIGHT-	(METERS)	TOP = 2890.72
		BASE= 143.87
SIGMAR(AZ) AT THE SURFACE	(DEGREES)	16.7937
SIGMER(EL) AT THE SURFACE	(DEGREES)	3.6665

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
1	2.64	0.10	250.70	1.40	14.3723	4.7599
2	2.73	0.10	252.10	1.40	11.4436	6.2330
3	2.83	0.10	253.50	1.40	10.6597	6.8573
4	2.93	0.10	254.90	1.40	10.1954	7.2863
5	3.04	0.10	256.30	1.40	9.8669	7.6204
6	3.17	0.17	255.17	-3.67	9.5476	7.9748
7	3.34	0.17	251.50	-3.67	6.5207	5.7838
8	3.52	0.17	247.83	-3.67	2.3361	2.1940
9	3.69	0.17	243.83	-4.33	1.0000	1.0000
10	3.86	0.17	239.50	-4.33	1.0000	1.0000
11	4.03	0.17	235.17	-4.33	1.0000	1.0000
12	4.12	0.00	232.00	-2.00	1.0000	1.0000
13	4.24	0.26	230.00	-2.00	1.0000	1.0000
14	4.50	0.26	228.00	-2.00	1.0000	1.0000
15	4.81	0.36	226.00	-2.00	1.0000	1.0000
16	5.07	0.15	225.00	0.00	1.0000	1.0000
17	5.07	-0.15	225.00	0.00	1.0000	1.0000
18	4.81	-0.36	224.00	-2.00	1.0000	1.0000
19	4.32	-0.62	223.00	0.00	1.0000	1.0000
20	3.55	-0.93	224.50	3.00	1.0000	1.0000
21	2.78	-0.62	228.00	4.00	1.0000	1.0000
22	2.26	-0.41	231.50	3.00	1.0000	1.0000
23	1.85	-0.41	238.75	11.50	1.0000	1.0000
24	1.44	-0.41	250.25	11.50	1.0000	1.0000
25	1.13	-0.21	262.50	13.00	1.0000	1.0000
26	1.02	-0.01	278.75	19.50	1.0000	1.0000
27	1.01	-0.01	298.25	19.50	1.0000	1.0000
28	1.00	-0.01	317.75	19.50	1.0000	1.0000
29	1.00	0.00	334.81	14.63	1.0000	1.0000
30	1.00	0.00	349.44	14.63	1.0000	1.0000

----- CALCULATED METEOROLOGICAL LAYER PARAMETERS -----

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
31	1.00	0.00	4.06	14.63	1.0000	1.0000
32	1.00	0.00	16.86	10.97	1.0000	1.0000
33	1.00	0.00	25.71	6.74	1.0000	1.0000

TRANSITION LAYER NUMBER- 1

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	143.87	301.58	3.60		246.00		1.0000	1.0000
LAYER-			3.09	0.22	252.40	2.76	8.6595	5.9374
BOTTOM-	0.00	302.12	2.57		250.00		16.7937	3.6665

TRANSITION LAYER NUMBER- 2

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	2890.72	312.17	1.00		29.09		1.0000	1.0000
LAYER-			2.15	1.61	234.26	11.81	1.0000	1.0000
BOTTOM-	143.87	301.58	3.60		246.00		1.0000	1.0000

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 738.9 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 143.9 AND 2890.7 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
2000.000	50.290	41.099	5.226	8.833
3000.000	51.821	36.163	6.838	12.406
4000.009	52.341	31.091	10.151	16.028
5000.000	52.725	26.007	13.414	21.051
6000.000	53.127	21.360	16.642	29.278
7000.000	53.282	17.459	19.841	42.672
8000.786	53.454	14.274	23.022	71.528
9000.970	53.416	11.743	26.186	81.438
10000.644	53.607	9.704	29.338	116.090
11000.763	53.582	8.083	32.482	179.290
12000.408	53.784	6.767	35.620	200.930
13000.475	53.767	5.715	38.752	220.261
14000.542	53.753	4.857	41.791	238.653
15000.611	53.740	4.153	44.759	257.047
16000.224	53.954	3.570	47.725	275.444
17000.254	53.944	3.094	50.688	293.843
18000.283	53.936	2.697	53.649	312.243
19000.313	53.928	2.365	56.608	330.645
20000.344	53.921	2.085	59.566	349.048
21000.373	53.915	1.848	62.522	367.452
22000.404	53.910	1.647	65.478	385.857
23000.055	54.132	1.473	68.432	404.262
24000.061	54.127	1.326	71.386	422.668
25000.068	54.123	1.199	74.339	441.075
26000.074	54.119	1.090	77.291	459.482
27000.082	54.116	0.994	80.243	477.889
28000.090	54.113	0.910	83.194	496.297
29000.096	54.110	0.837	86.144	514.705
30000.104	54.107	0.772	89.095	533.114
31000.111	54.104	0.714	92.044	551.523
32000.117	54.101	0.663	94.994	569.932
33000.125	54.099	0.616	97.943	588.341
34000.133	54.097	0.575	100.892	606.750
35000.141	54.095	0.538	103.841	625.160
36000.148	54.093	0.504	106.789	643.570
37000.156	54.091	0.473	109.738	661.980
38000.164	54.089	0.445	112.686	680.390

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 738.9 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 143.9 AND 2890.7 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
39000.172	54.087	0.420	115.633	698.800
40000.180	54.086	0.396	118.581	717.210
41000.188	54.084	0.375	121.529	735.621
42000.195	54.083	0.355	124.476	754.031
43000.203	54.082	0.336	127.423	772.442
44000.211	54.080	0.319	130.370	790.853
45000.020	54.309	0.303	133.317	809.263
46000.020	54.308	0.288	136.264	827.674
47000.020	54.307	0.274	139.211	846.085
48000.020	54.306	0.262	142.158	864.496
49000.016	54.305	0.250	145.104	882.907
50000.016	54.304	0.239	148.051	901.319
51000.016	54.303	0.228	150.997	919.730
52000.016	54.302	0.218	153.944	938.141
53000.016	54.301	0.209	156.890	956.552
54000.016	54.301	0.200	159.836	974.964
55000.016	54.300	0.192	162.783	993.375
56000.016	54.299	0.184	165.729	1011.786
57000.016	54.298	0.177	168.675	1030.198
58000.016	54.298	0.170	171.621	1048.609
59000.016	54.297	0.164	174.567	1067.021
60000.016	54.296	0.157	177.513	1085.432

	RANGE	BEARING
41.099 IS THE MAXIMUM PEAK CONCENTRATION	2000.0	50.3

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 738.9 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 143.9 AND 2890.7 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
2000.000	50.290	12194.985	5.226	8.833
3000.000	51.821	11176.139	6.838	12.406
4000.009	52.341	10273.823	10.151	16.028
5000.000	52.725	9350.185	13.414	21.051
6000.000	53.127	8426.411	16.642	29.278
7000.000	53.282	7576.505	19.841	42.672
8000.786	53.454	6806.659	23.022	71.528
9000.970	53.416	6133.988	26.186	81.438
10000.644	53.607	5530.417	29.338	116.090
11000.763	53.582	5002.932	32.482	179.290
12000.408	53.784	4528.994	35.620	200.930
13000.475	53.767	4118.012	38.752	220.261
14000.542	53.753	3752.510	41.791	238.653
15000.611	53.740	3427.935	44.759	257.047
16000.224	53.954	3136.690	47.725	275.444
17000.254	53.944	2884.142	50.688	293.843
18000.283	53.936	2659.794	53.649	312.243
19000.313	53.928	2460.431	56.608	330.645
20000.344	53.921	2283.144	59.566	349.048
21000.373	53.915	2125.320	62.522	367.452
22000.404	53.910	1984.626	65.478	385.857
23000.055	54.132	1855.464	68.432	404.262
24000.061	54.127	1744.063	71.386	422.668
25000.068	54.123	1644.106	74.339	441.075
26000.074	54.119	1554.198	77.291	459.482
27000.082	54.116	1473.113	80.243	477.889
28000.090	54.113	1399.777	83.194	496.297
29000.096	54.110	1333.244	86.144	514.705
30000.104	54.107	1272.692	89.095	533.114
31000.111	54.104	1217.401	92.044	551.523
32000.117	54.101	1166.743	94.994	569.932
33000.125	54.099	1120.173	97.943	588.341
34000.133	54.097	1077.217	100.892	606.750
35000.141	54.095	1037.461	103.841	625.160
36000.148	54.093	1000.548	106.789	643.570
37000.156	54.091	966.166	109.738	661.980
38000.164	54.089	934.046	112.686	680.390

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 738.9 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 143.9 AND 2890.7 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
39000.172	54.087	903.952	115.633	698.800
40000.180	54.086	875.680	118.581	717.210
41000.188	54.084	849.051	121.529	735.621
42000.195	54.083	823.910	124.476	754.031
43000.203	54.082	800.121	127.423	772.442
44000.211	54.080	777.564	130.370	790.853
45000.020	54.309	754.214	133.317	809.263
46000.020	54.308	733.958	136.264	827.674
47000.020	54.307	714.646	139.211	846.085
48000.020	54.306	696.205	142.158	864.496
49000.016	54.305	678.573	145.104	882.907
50000.016	54.304	661.691	148.051	901.319
51000.016	54.303	645.511	150.997	919.730
52000.016	54.302	629.985	153.944	938.141
53000.016	54.301	615.074	156.890	956.552
54000.016	54.301	600.740	159.836	974.964
55000.016	54.300	586.949	162.783	993.375
56000.016	54.299	573.672	165.729	1011.786
57000.016	54.298	560.879	168.675	1030.198
58000.016	54.298	548.545	171.621	1048.609
59000.016	54.297	536.648	174.567	1067.021
60000.016	54.296	525.164	177.513	1085.432

12194.985 IS THE MAXIMUM TOTAL DOSAGE

RANGE	BEARING
2000.0	50.3

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 738.9 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 143.9 AND 2890.7 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	30.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
2000.000	50.290	6.775	5.226	8.833
3000.000	51.821	6.209	6.838	12.406
4000.009	52.341	5.708	10.151	16.028
5000.000	52.725	5.195	13.414	21.051
6000.000	53.127	4.681	16.642	29.278
7000.000	53.282	4.209	19.841	42.672
8000.786	53.454	3.781	23.022	71.528
9000.970	53.416	3.408	26.186	81.438
10000.644	53.607	3.072	29.338	116.090
11000.763	53.582	2.779	32.482	179.290
12000.408	53.784	2.514	35.620	200.930
13000.475	53.767	2.284	38.752	220.261
14000.542	53.753	2.077	41.791	238.653
15000.611	53.740	1.892	44.759	257.047
16000.224	53.954	1.725	47.725	275.444
17000.254	53.944	1.577	50.688	293.843
18000.283	53.936	1.445	53.649	312.243
19000.313	53.928	1.326	56.608	330.645
20000.344	53.921	1.218	59.566	349.048
21000.373	53.915	1.122	62.522	367.452
22000.404	53.910	1.035	65.478	385.857
23000.055	54.132	0.955	68.432	404.262
24000.061	54.127	0.885	71.386	422.668
25000.068	54.123	0.822	74.339	441.075
26000.074	54.119	0.765	77.291	459.482
27000.082	54.116	0.714	80.243	477.889
28000.090	54.113	0.667	83.194	496.297
29000.096	54.110	0.625	86.144	514.705
30000.104	54.107	0.586	89.095	533.114
31000.111	54.104	0.551	92.044	551.523
32000.117	54.101	0.518	94.994	569.932
33000.125	54.099	0.489	97.943	588.341
34000.133	54.097	0.462	100.892	606.750
35000.141	54.095	0.437	103.841	625.160
36000.148	54.093	0.414	106.789	643.570
37000.156	54.091	0.392	109.738	661.980

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----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 738.9 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 143.9 AND 2890.7 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	30.0 MIN. MEAN CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)
38000.164	54.089	0.373	112.686	680.390
39000.172	54.087	0.354	115.633	698.800
40000.180	54.086	0.337	118.581	717.210
41000.188	54.084	0.321	121.529	735.621
42000.195	54.083	0.306	124.476	754.031
43000.203	54.082	0.292	127.423	772.442
44000.211	54.080	0.279	130.370	790.853
45000.020	54.309	0.266	133.317	809.263
46000.020	54.308	0.254	136.264	827.674
47000.020	54.307	0.244	139.211	846.085
48000.020	54.306	0.233	142.158	864.496
49000.016	54.305	0.224	145.104	882.907
50000.016	54.304	0.215	148.051	901.319
51000.016	54.303	0.206	150.997	919.730
52000.016	54.302	0.198	153.944	938.141
53000.016	54.301	0.190	156.890	956.552
54000.016	54.301	0.183	159.836	974.964
55000.016	54.300	0.176	162.783	993.375
56000.016	54.299	0.169	165.729	1011.786
57000.016	54.298	0.163	168.675	1030.198
58000.016	54.298	0.157	171.621	1048.609
59000.016	54.297	0.152	174.567	1067.021
60000.016	54.296	0.146	177.513	1085.432

	RANGE	BEARING
6.775 IS THE MAXIMUM 30.0 MIN. MEAN CONCENTRATION	2000.0	50.3

*** REEDM HAS TERMINATED

4. Ground-Level HCl Exposure Doses Calculated from T–1.4 h Rawinsonde Data

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 3
VERSION 7.05 AT KSC
1433 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1222 Z 14 MAY 95 T -1.4 HR

****

----- PROGRAM OPTIONS -----

MODEL		CONCENTRATION
RUN TYPE		OPERATIONAL
WIND-FIELD TERRAIN EFFECTS MODEL		NONE
LAUNCH VEHICLE		TITAN IV
LAUNCH TYPE		NORMAL
LAUNCH COMPLEX NUMBER		40
TURBULENCE PARAMETERS ARE DETERMINED FROM		CLIMATOLOGICAL DATA
SPECIES		HCL
CLOUD SHAPE		ELLIPTICAL
CALCULATION HEIGHT		SURFACE
PROPELLANT TEMPERATURE (DEG. C)		25.74
CONCENTRATION AVERAGING TIME (SEC.)		1800.00
DECAY COEFFICIENT		0.0000
ABSORPTION COEFFICIENT (RNG- 0 TO 1,NO ABSORPTION=0)		0.0000
DIFFUSION COEFFICIENTS	LATERAL	1.0000
	VERTICAL	1.0000
VEHICLE AIR ENTRAINMENT PARAMETER	GAMMAE	0.6400
DOWNWIND EXPANSION DISTANCE (METERS)	LATERAL	100.00
	VERTICAL	100.00

----- DATA FILES -----

INPUT FILES

RAWINSONDE FILE	k23_1222.raw
DATA BASE FILE	rdmbase.ksc

OUTPUT FILES

PRINT FILE	k23d1222.sur
PLOT FILE	k23d1222.u_p

----- METEOROLOGICAL RAWINSONDE DATA -----

RAWINSONDE MSS/MSS
TIME- 1222 Z DATE- 14 MAY 95
ASCENT NUMBER 0

----- T -1.4 HR SOUNDING -----

MET. LEV. NO.	ALTITUDE MSL (FT)	ALTITUDE GND (FT)	GND (M)	WIND DIR (DEG)	WIND SPEED (M/S)	WIND SPEED (KTS)	AIR TEMP (DEG C)	AIR PTEMP (DEG C)	AIR DPTEMP (DEG C)	AIR PRESS (MB)	AIR RH (%)	H M	INT-ERP
1	16	0.0	0.0	250	2.6	5.0	27.1	29.0	23.6	1016.4	81.0		
2	63	46.8	14.3	251	2.7	5.2	26.8	28.8	23.4	1014.8	81.9		**
3	110	93.6	28.5	253	2.8	5.4	26.5	28.6	23.2	1013.2	82.5		**
4	156	140.4	42.8	254	2.9	5.6	26.1	28.3	23.1	1011.5	83.2		**
5	203	187.2	57.1	256	3.0	5.8	25.8	28.1	22.9	1009.9	83.8		**
6	250	234.0	71.3	257	3.1	6.0	25.5	27.9	22.7	1008.3	84.0		
7	329	313.3	95.5	253	3.3	6.3	25.4	28.1	22.6	1005.5	84.5		**
8	409	392.7	119.7	250	3.4	6.7	25.4	28.2	22.6	1002.8	84.5		**
9	488	472.0	143.9	246	3.6	7.0	25.3	28.4	22.5	1000.0	85.0	*	
10	659	642.7	195.9	242	3.8	7.3	25.4	29.0	22.3	994.1	83.2		**
11	829	813.3	247.9	237	3.9	7.7	25.4	29.5	22.1	988.3	81.9		**
12	1000	984.0	299.9	233	4.1	8.0	25.5	30.1	21.9	982.5	81.0		
13	1142	1126.0	343.2	231	4.1	8.0	25.7	30.7	21.6	977.8	78.0		
14	1414	1398.0	426.1	229	4.4	8.5	25.5	31.2	20.9	968.7	75.4		**
15	1686	1670.0	509.0	227	4.6	9.0	25.4	31.8	20.1	959.6	72.0		
16	2000	1984.0	604.7	225	5.0	9.7	24.8	32.1	19.8	949.3	74.0		
17	2606	2590.0	789.4	225	5.1	10.0	23.7	32.7	18.9	929.6	75.0		
18	3000	2984.0	909.5	225	5.0	9.7	22.6	32.8	18.4	916.9	77.0		
19	3528	3512.0	1070.5	223	4.6	9.0	21.4	33.1	17.9	900.0	81.0		
20	4000	3984.0	1214.3	223	4.0	7.8	20.1	33.2	17.5	885.4	85.0		
21	4717	4701.0	1432.9	226	3.1	6.0	18.2	33.3	16.5	863.3	90.0		
22	5000	4984.0	1519.1	230	2.5	4.8	17.9	33.7	15.3	854.7	85.0		
23	5147	5131.0	1563.9	233	2.1	4.0	17.7	33.9	14.7	850.0	83.0		
24	5574	5557.5	1693.9	245	1.6	3.2	17.0	34.3	13.2	837.3	78.6		**
25	6000	5984.0	1823.9	256	1.2	2.4	16.3	34.7	11.7	824.9	74.0		
26	6323	6307.0	1922.4	269	1.0	2.0	15.5	34.8	10.8	815.4	74.0		
27	6497	6480.7	1975.3	289	1.0	2.0	15.3	35.1	9.6	810.2	69.1		**
28	6670	6654.3	2028.2	308	1.0	2.0	15.1	35.3	8.3	805.1	64.5		**
29	6844	6828.0	2081.2	328	1.0	1.9	14.9	35.5	7.1	800.0	59.0		
30	6922	6906.0	2104.9	342	1.0	1.9	14.8	35.5	6.2	797.9	57.0		**
31	7000	6984.0	2128.7	357	1.0	1.9	14.7	35.6	5.3	795.9	54.0		
32	7427	7411.0	2258.9	11	1.0	1.9	14.2	36.0	-0.3	783.8	37.0		
33	8628	8612.0	2624.9	22	1.0	1.9	11.9	37.6	1.6	750.0	49.0		
34	9500	9484.0	2890.7	29	1.0	1.9	10.6	39.0	0.8	727.0	51.5		**

* - INDICATES THE CALCULATED TOP OF THE SURFACE MIXING LAYER
** - INDICATES THAT DATA IS LINEARLY INTERPOLATED FROM INPUT METEOROLOGY

----- METEOROLOGICAL RAWINSONDE DATA -----

SURFACE AIR DENSITY (GM/M**3)	1166.55
DEFAULT CALCULATED MIXING LAYER HEIGHT (M)	143.87
CLOUD COVER IN TENTHS OF CELESTIAL DOME	0.0
CLOUD CEILING (M)	9999.0

----- PLUME RISE DATA -----

EXHAUST RATE OF MATERIAL-	(GRAMS/SEC)		4.22354E+06
TOTAL MATERIAL OUTPUT-	(GRAMS)		5.36146E+08
HEAT OUTPUT PER GRAM-	(CALORIES)		1555.5800
VEHICLE RISE TIME PARAMETERS-	(TK=(A*Z**B)+C)	A=	0.8678
		B=	0.4500
		C=	0.0000

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ROCKET EXHAUST EFFLUENT DIFFUSION MODEL REEDM PAGE 6
VERSION 7.05 AT KSC
1433 EST 14 FEB 1996
launch time: 0945 EDT 14 MAY 1995
RAWINSONDE ASCENT NUMBER 0, 1222 Z 14 MAY 95 T -1.4 HR

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----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)	CLOUD RISE TIME (SECONDS)		CLOUD RISE RANGE (METERS)	CLOUD RISE BEARING (DEGREES)	STABILIZED CLOUD RANGE (METERS)	STABILIZED CLOUD BEARING (DEGREES)
1	14.3	2.6		3.4	70.4	0.0	0.0
2	28.5	4.1		8.9	71.0	0.0	0.0
3	42.8	5.6		13.0	71.5	0.0	0.0
4	57.1	7.0		17.2	72.2	0.0	0.0
5	71.3	8.5		21.6	72.9	0.0	0.0
6	95.5	11.3		28.2	73.7	0.0	0.0
7	119.7	14.3		37.6	73.6	0.0	0.0
8	143.9	17.6		48.5	72.7	0.0	0.0
9	195.9	25.9		69.3	70.5	0.0	0.0
10	247.9	35.5		102.7	67.6	0.0	0.0
11	299.9	46.5		142.9	64.6	1109.9	56.4
12	343.2	56.7		185.5	62.0	1130.6	53.6
13	426.1	79.0		252.3	59.0	1132.0	52.0
14	509.0	106.1		359.3	56.0	1170.6	50.4
15	604.7	146.9		516.0	53.2	1187.1	49.1
16	789.4	286.9	*	1319.1	48.2	1319.1	48.2
17	909.5	286.9	*	1319.1	48.2	1319.1	48.2
18	1070.5	286.9	*	1319.1	48.2	1319.1	48.2
19	1214.3	286.9	*	1319.1	48.2	1319.1	48.2
20	1432.9	286.9	*	1319.1	48.2	1319.1	48.2
21	1519.1	286.9	*	1319.1	48.2	1319.1	48.2
22	1563.9	286.9	*	1319.1	48.2	1319.1	48.2
23	1693.9	286.9	*	1319.1	48.2	1319.1	48.2
24	1823.9	286.9	*	1319.1	48.2	1319.1	48.2
25	1922.4	286.9	*	1319.1	48.2	1319.1	48.2
26	1975.3	286.9	*	1319.1	48.2	1319.1	48.2
27	2028.2	286.9	*	1319.1	48.2	1319.1	48.2
28	2081.2	286.9	*	1319.1	48.2	1319.1	48.2
29	2104.9	286.9	*	1319.1	48.2	1319.1	48.2
30	2128.7	286.9	*	1319.1	48.2	1319.1	48.2
31	2258.9	286.9	*	1319.1	48.2	1319.1	48.2
32	2624.9	286.9	*	1319.1	48.2	1319.1	48.2
33	2890.7	286.9	*	1319.1	48.2	1319.1	48.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- EXHAUST CLOUD -----

MET. LAYER NO.	TOP OF LAYER (METERS)		LAYER SOURCE STRENGTH (GRAMS)	CLOUD UPDRAFT VELOCITY (M/S)	CLOUD RADIUS (METERS)	STD. DEVIATION MATERIAL DIST. ALONGWIND (METERS)	CROSSWIND (METERS)
1	14.3		0.00000E+00	8.6	0.0	0.0	0.0
2	28.5		0.00000E+00	9.9	0.0	0.0	0.0
3	42.8		0.00000E+00	10.0	0.0	0.0	0.0
4	57.1		0.00000E+00	9.6	0.0	0.0	0.0
5	71.3		0.00000E+00	9.2	0.0	0.0	0.0
6	95.5		0.00000E+00	8.4	0.0	0.0	0.0
7	119.7		0.00000E+00	7.6	0.0	0.0	0.0
8	143.9		0.00000E+00	7.0	0.0	0.0	0.0
9	195.9		0.00000E+00	5.8	0.0	0.0	0.0
10	247.9		0.00000E+00	5.0	0.0	0.0	0.0
11	299.9		1.74718E+05	4.5	282.8	131.8	131.8
12	343.2		1.07451E+06	4.0	349.4	162.8	162.8
13	426.1		4.09799E+06	3.4	413.2	192.5	192.5
14	509.0		6.28986E+06	2.7	471.8	219.8	219.8
15	604.7		9.22714E+06	2.0	512.9	239.0	239.0
16	789.4	*	2.27301E+07	0.0	542.6	252.9	252.9
17	909.5	*	1.76831E+07	0.0	532.9	248.3	248.3
18	1070.5	*	1.89259E+07	0.0	482.9	225.0	225.0
19	1214.3	*	9.22771E+06	0.0	365.2	170.2	170.2
20	1432.9	*	6.92036E+06	0.0	199.9	93.2	93.2
21	1519.1	*	2.57035E+06	0.0	199.9	93.2	93.2
22	1563.9	*	1.30349E+06	0.0	199.9	93.2	93.2
23	1693.9	*	3.66961E+06	0.0	199.9	93.2	93.2
24	1823.9	*	3.51775E+06	0.0	199.9	93.2	93.2
25	1922.4	*	2.57322E+06	0.0	199.9	93.2	93.2
26	1975.3	*	1.35362E+06	0.0	199.9	93.2	93.2
27	2028.2	*	1.33381E+06	0.0	199.9	93.2	93.2
28	2081.2	*	1.31480E+06	0.0	199.9	93.2	93.2
29	2104.9	*	5.84536E+05	0.0	199.9	93.2	93.2
30	2128.7	*	5.80916E+05	0.0	199.9	93.2	93.2
31	2258.9	*	3.11866E+06	0.0	199.9	93.2	93.2
32	2624.9	*	8.27526E+06	0.0	199.9	93.2	93.2
33	2890.7	*	5.61678E+06	0.0	199.9	93.2	93.2

* - INDICATES CLOUD STABILIZATION TIME WAS USED

----- CLOUD STABILIZATION -----

CALCULATION HEIGHT	(METERS)	0.00
STABILIZATION HEIGHT	(METERS)	738.90
STABILIZATION TIME	(SECS)	286.88
FIRST MIXING LAYER HEIGHT-	(METERS)	TOP = 143.87
		BASE= 0.00
SECOND SELECTED LAYER HEIGHT-	(METERS)	TOP = 2890.72
		BASE= 143.87
SIGMAR(AZ) AT THE SURFACE	(DEGREES)	16.7937
SIGMER(EL) AT THE SURFACE	(DEGREES)	3.6665

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
1	2.64	0.10	250.70	1.40	14.3723	4.7599
2	2.73	0.10	252.10	1.40	11.4436	6.2330
3	2.83	0.10	253.50	1.40	10.6597	6.8573
4	2.93	0.10	254.90	1.40	10.1954	7.2863
5	3.04	0.10	256.30	1.40	9.8669	7.6204
6	3.17	0.17	255.17	-3.67	9.5476	7.9748
7	3.34	0.17	251.50	-3.67	6.5207	5.7838
8	3.52	0.17	247.83	-3.67	2.3361	2.1940
9	3.69	0.17	243.83	-4.33	1.0000	1.0000
10	3.86	0.17	239.50	-4.33	1.0000	1.0000
11	4.03	0.17	235.17	-4.33	1.0000	1.0000
12	4.12	0.00	232.00	-2.00	1.0000	1.0000
13	4.24	0.26	230.00	-2.00	1.0000	1.0000
14	4.50	0.26	228.00	-2.00	1.0000	1.0000
15	4.81	0.36	226.00	-2.00	1.0000	1.0000
16	5.07	0.15	225.00	0.00	1.0000	1.0000
17	5.07	-0.15	225.00	0.00	1.0000	1.0000
18	4.81	-0.36	224.00	-2.00	1.0000	1.0000
19	4.32	-0.62	223.00	0.00	1.0000	1.0000
20	3.55	-0.93	224.50	3.00	1.0000	1.0000
21	2.78	-0.62	228.00	4.00	1.0000	1.0000
22	2.26	-0.41	231.50	3.00	1.0000	1.0000
23	1.85	-0.41	238.75	11.50	1.0000	1.0000
24	1.44	-0.41	250.25	11.50	1.0000	1.0000
25	1.13	-0.21	262.50	13.00	1.0000	1.0000
26	1.02	-0.01	278.75	19.50	1.0000	1.0000
27	1.01	-0.01	298.25	19.50	1.0000	1.0000
28	1.00	-0.01	317.75	19.50	1.0000	1.0000
29	1.00	0.00	334.81	14.63	1.0000	1.0000
30	1.00	0.00	349.44	14.63	1.0000	1.0000

----- CALCULATED METEOROLOGICAL LAYER PARAMETERS -----

MET. LAYER NO.	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIRECTION (DEG)	WIND DIRECTION SHEAR (DEG)	SIGMA OF AZI ANG (DEG)	SIGMA OF ELE ANG (DEG)
31	1.00	0.00	4.06	14.63	1.0000	1.0000
32	1.00	0.00	16.86	10.97	1.0000	1.0000
33	1.00	0.00	25.71	6.74	1.0000	1.0000

TRANSITION LAYER NUMBER- 1

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	143.87	301.58	3.60		246.00		1.0000	1.0000
LAYER-			3.09	0.22	252.40	2.76	8.6595	5.9374
BOTTOM-	0.00	302.12	2.57		250.00		16.7937	3.6665

TRANSITION LAYER NUMBER- 2

VALUE AT	HEIGHT (METERS)	TEMP. (DEG K)	WIND SPEED (M/SEC)	WIND SPEED SHEAR (M/SEC)	WIND DIR. (DEG)	WIND DIR. SHEAR (DEG)	SIGMA AZI. (DEG)	SIGMA ELE. (DEG)
TOP-	2890.72	312.17	1.00		29.09		1.0000	1.0000
LAYER-			2.15	1.61	234.26	11.81	1.0000	1.0000
BOTTOM-	143.87	301.58	3.60		246.00		1.0000	1.0000

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 143.9 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	PEAK CONCEN-TRATION (PPM)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)

** NO HCL FOUND **

----- MAXIMUM CENTERLINE CALCULATIONS -----

CONCENTRATION OF HCL AT A HEIGHT OF 0.0 METERS
DOWNWIND FROM A TITAN IV NORMAL LAUNCH
CALCULATIONS APPLY TO THE LAYER BETWEEN 0.0 AND 143.9 METERS

RANGE FROM PAD (METERS)	BEARING FROM PAD (DEGREES)	TOTAL DOSAGE (PPM SEC)	CLOUD ARRIVAL TIME (MIN)	CLOUD DEPARTURE TIME (MIN)

** NO HCL FOUND **

Appendix D- Meteorological Data Measured at CCAS Before and After the #K23 Launch

[Material in this Appendix was contributed by Douglas Schulthess of The Aerospace Corporation's Eastern Range Systems Engineering Directorate and Randy Evans of Ensco, Inc.'s Applied Meteorology Unit]

Meteorological data were measured at a number of CCAS monitoring locations prior to launch and during development and dispersion of the launch cloud. Representative data of three different types are tabulated here. Data are first presented for meteorological measurements performed at various Zulu times (**TIME**) at numerous meteorological towers [designated by their latitudinal and longitudinal positions in degrees (**LAT** and **LON**, respectively)] at various elevations (**Z**) in feet. It is noted that the #K23 launch occurred at 13:45 Zulu time (Zulu time is EST + 4 hours). Data are presented on the wind direction in degrees azimuth (**DIR**), the wind speed in knots (**SPD**), and the ambient and dew point temperatures in degrees Fahrenheit (**T** and **TD**, respectively) at these locations.

Rawinsonde data collected at various Zulu times are presented next. Here altitude (**ALT**) is expressed in geometric feet, **I/R** is a measure of the refractive index of air, **V/S** is the speed of sound in air in knots at the indicated altitude, **VPS** the saturation vapor pressure of water at the temperature measured at the given altitude, and **PW** is the precipitable water in the vertical column of air leading up to the altitude indicated.

Doppler radar wind profiler data are presented third. These data were determined at Mosquito Lagoon (latitude 28.60 degrees, longitude 80.59 degrees). Virtual temperature, wind speed, and wind direction data are tabulated as a function of elevation (height) in kilometers and time (Zulu). [In a system of moist air, virtual temperature corresponds to the temperature of dry air that would have the same pressure and density as the moist air. Virtual temperature is approximated by the equation: $T_V = (1 + 0.61q)T$, where T is the temperature and q is the specific humidity.] It should be noted that the Doppler radar data should be used with caution. The Doppler radar system at Mosquito Lagoon has been newly installed and is under evaluation. The system has not yet been certified as an operational system. More complete tabulations of these meteorological data are available from Gary Loper of The Aerospace Corporation, phone (310) 336-5922.

METEOROLOGICAL TOWER DATA AT 10:10:00 ZULU TIME (T - 3 hours and 35 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	101000	28.4338	80.5734	6			74	
95134	101000	28.4338	80.5734	12	219	0.0		
95134	101000	28.4338	80.5734	54	232	4.1	77	
95134	101000	28.4598	80.5267	6			75	
95134	101000	28.4598	80.5267	12	254	2.9		
95134	101000	28.4598	80.5267	54	229	4.1	77	
95134	101000	28.4466	80.5652	6				
95134	101000	28.7435	80.7005	6			78	75
95134	101000	28.7435	80.7005	54	220	6.0		
95134	101000	28.7975	80.7378	6			79	74
95134	101000	28.7975	80.7378	54	236	6.0		
95134	101000	28.4721	80.5393	6				
95134	101000	28.4721	80.5393	90	227	6.0		
95134	101000	28.5622	80.5785	6				
95134	101000	28.5622	80.5785	54	244	2.9		
95134	101000	28.5836	80.5842	6				
95134	101000	28.5836	80.5842	54	230	2.9		
95134	101000	28.5130	80.5613	6			72	73
95134	101000	28.5130	80.5613	12	270	0.0		
95134	101000	28.5130	80.5613	54	244	4.1	77	
95134	101000	28.5130	80.5613	162	246	8.0		
95134	101000	28.5130	80.5613	204	239	8.0	78	
95134	101000	28.5130	80.5613	6			71	71
95134	101000	28.5130	80.5613	12	248	0.0		
95134	101000	28.5130	80.5613	54	241	4.1	76	
95134	101000	28.5130	80.5613	162	248	8.0		
95134	101000	28.5130	80.5613	204	246	8.0	78	
95134	101000	28.5358	80.5747	6			78	
95134	101000	28.5358	80.5747	12	242	2.9		
95134	101000	28.5358	80.5747	54	235	5.1	78	
95134	101000	28.6141	80.6203	6			75	
95134	101000	28.6141	80.6203	12	239	1.0		
95134	101000	28.6141	80.6203	54	238	2.9	77	
95134	101000	28.4048	80.6519	6			77	76
95134	101000	28.4048	80.6519	54	255	4.1		
95134	101000	28.4600	80.5711	6			69	
95134	101000	28.4600	80.5711	12	0	0.0		
95134	101000	28.4600	80.5711	54	226	4.1	76	
95134	101000	28.6027	80.6414	6			73	
95134	101000	28.6027	80.6414	12	0	0.0		
95134	101000	28.6027	80.6414	54	223	2.9	76	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	101000	28.6105	80.6069	6				74
95134	101000	28.6105	80.6069	60	202	1.9	76	
95134	101000	28.6057	80.6016	6			76	74
95134	101000	28.6057	80.6016	60	229	2.9	76	
95134	101000	28.6294	80.6235	6				73
95134	101000	28.6294	80.6235	60	247	1.9	76	
95134	101000	28.6248	80.6182	6			75	73
95134	101000	28.6248	80.6182	60	259	1.0	76	
95134	101000	28.4586	80.5923	6			78	
95134	101000	28.4586	80.5923	12	236	4.1		
95134	101000	28.4586	80.5923	54	229	6.0	78	
95134	101000	28.6062	80.6739	6			71	
95134	101000	28.6062	80.6739	12	0	0.0		
95134	101000	28.6062	80.6739	54	208	1.9	76	
95134	101000	28.6586	80.6998	6			70	
95134	101000	28.6586	80.6998	12	0	0.0		
95134	101000	28.6586	80.6998	54	280	0.0	74	
95134	101000	28.7055	80.7265	6			72	72
95134	101000	28.7055	80.7265	54	204	1.9		
95134	101000	28.7755	80.8043	6			79	76
95134	101000	28.7755	80.8043	54	9	4.1		
95134	101000	28.5158	80.6400	6			73	
95134	101000	28.5158	80.6400	12	0	0.0		
95134	101000	28.5158	80.6400	54	259	1.0	75	
95134	101000	28.5623	80.6694	6			73	
95134	101000	28.5623	80.6694	12	0	0.0		
95134	101000	28.5623	80.6694	54	225	1.9	75	
95134	101000	28.5986	80.6817	6				
95134	101000	28.5986	80.6817	30	169	1.0		
95134	101000	28.6160	80.6930	6			77	74
95134	101000	28.6160	80.6930	30	212	2.9		
95134	101000	28.6307	80.7027	6				
95134	101000	28.6307	80.7027	30	197	1.9		
95134	101000	28.6431	80.7482	6			73	
95134	101000	28.6431	80.7482	12	0	0.0		
95134	101000	28.6431	80.7482	54	212	1.9	75	
95134	101000	28.4632	80.6702	6			72	
95134	101000	28.4632	80.6702	12	0	0.0		
95134	101000	28.4632	80.6702	54	254	1.0	75	
95134	101000	28.5184	80.6962	6			72	
95134	101000	28.5184	80.6962	12	0	0.0		
95134	101000	28.5184	80.6962	54	225	1.9	76	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	101000	28.7464	80.8707	6			71	
95134	101000	28.7464	80.8707	54	0	0.0		
95134	101000	28.4079	80.7604	6				
95134	101000	28.4079	80.7604	54				
95134	101000	28.5272	80.7742	6			75	73
95134	101000	28.5272	80.7742	54	0	0.0		
95134	101000	28.6056	80.8248	6				
95134	101000	28.6056	80.8248	54				
95134	101000	28.5697	80.5864	6			78	76
95134	101000	28.5697	80.5864	12	256	1.0		
95134	101000	28.5697	80.5864	54	252	2.9	78	
95134	101000	28.5697	80.5864	162	235	5.1		
95134	101000	28.5697	80.5864	204	235	6.0	78	
95134	101000	28.5697	80.5864	6			78	78
95134	101000	28.5697	80.5864	12	262	1.0		
95134	101000	28.5697	80.5864	54	254	2.9	78	
95134	101000	28.5697	80.5864	162	236	5.1		
95134	101000	28.5697	80.5864	204	239	6.0	77	
95134	101000	28.4843	80.7856	6			71	
95134	101000	28.4843	80.7856	54	0	0.0		
95134	101000	28.6445	80.9034	6				
95134	101000	28.4114	80.9284	6			68	
95134	101000	28.4114	80.9284	54	0	0.0		
95134	101000	28.4475	80.8538	6				
95134	101000	28.4960	80.8843	6				
95134	101000	28.4960	80.8843	54				
95134	101000	28.5583	80.9132	6				
95134	101000	28.6173	80.9581	6			71	
95134	101000	28.6173	80.9581	54	169	1.9		
95134	101000	28.6762	80.9987	6				
95134	101000	28.6762	80.9987	54				
95134	101000	28.5231	81.0100	6				
95134	101000	28.5231	81.0100	54				
95134	101000	28.6489	81.0693	6				
95134	101000	28.6489	81.0693	54				
95134	101000	28.4417	81.0291	6			69	
95134	101000	28.4417	81.0291	54	247	1.9		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	101000	28.6256	80.6571	6			71	72
95134	101000	28.6256	80.6571	12	180	0.0		
95134	101000	28.6256	80.6571	54	236	1.9	76	
95134	101000	28.6256	80.6571	162	228	4.1		
95134	101000	28.6256	80.6571	204	232	4.1	78	
95134	101000	28.6256	80.6571	295	233	5.1		
95134	101000	28.6256	80.6571	394	230	6.0		
95134	101000	28.6256	80.6571	492	231	6.0	77	
95134	101000	28.6256	80.6571	6			71	72
95134	101000	28.6256	80.6571	12	0	0.0		
95134	101000	28.6256	80.6571	54	236	1.9	76	
95134	101000	28.6256	80.6571	162	226	6.0		
95134	101000	28.6256	80.6571	204	234	6.0	78	
95134	101000	28.6256	80.6571	295	231	7.0		
95134	101000	28.6256	80.6571	394	236	8.0		
95134	101000	28.6256	80.6571	492	233	9.9	77	
95134	101000	28.3932	80.8211	6			73	73
95134	101000	28.3932	80.8211	54	194	0.0		
95134	101000	28.3382	80.7321	6			73	72
95134	101000	28.3382	80.7321	54	243	1.0		

METEOROLOGICAL TOWER DATA AT 12:15:00 ZULU TIME (T - 1 hours and 30 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	121500	28.4338	80.5734	6			78	
95134	121500	28.4338	80.5734	12	241	1.9		
95134	121500	28.4338	80.5734	54	252	4.1	78	
95134	121500	28.4598	80.5267	6			78	
95134	121500	28.4598	80.5267	12	247	5.1		
95134	121500	28.4598	80.5267	54	242	6.0	77	
95134	121500	28.4466	80.5652	6				
95134	121500	28.7435	80.7005	6			80	77
95134	121500	28.7435	80.7005	54	225	4.1		
95134	121500	28.7975	80.7378	6			81	75
95134	121500	28.7975	80.7378	54	254	5.1		
95134	121500	28.4721	80.5393	6				
95134	121500	28.4721	80.5393	90	236	5.1		
95134	121500	28.5622	80.5785	6				
95134	121500	28.5622	80.5785	54	219	4.1		
95134	121500	28.5836	80.5842	6				
95134	121500	28.5836	80.5842	54	204	4.1		
95134	121500	28.5130	80.5613	6			79	78
95134	121500	28.5130	80.5613	12	241	1.9		
95134	121500	28.5130	80.5613	54	238	4.1	79	
95134	121500	28.5130	80.5613	162	237	5.1		
95134	121500	28.5130	80.5613	204	232	6.0	78	
95134	121500	28.5130	80.5613	6			79	76
95134	121500	28.5130	80.5613	12	239	1.9		
95134	121500	28.5130	80.5613	54	235	4.1	79	
95134	121500	28.5130	80.5613	162	240	5.1		
95134	121500	28.5130	80.5613	204	239	6.0	78	
95134	121500	28.5358	80.5747	6			78	
95134	121500	28.5358	80.5747	12	236	4.1		
95134	121500	28.5358	80.5747	54	226	6.0	78	
95134	121500	28.6141	80.6203	6			78	
95134	121500	28.6141	80.6203	12	213	4.1		
95134	121500	28.6141	80.6203	54	206	4.1	78	
95134	121500	28.4048	80.6519	6			78	
95134	121500	28.4048	80.6519	54	243	6.0		
95134	121500	28.4600	80.5711	6			78	
95134	121500	28.4600	80.5711	12	260	1.9		
95134	121500	28.4600	80.5711	54	246	2.9	78	
95134	121500	28.6027	80.6414	6			78	
95134	121500	28.6027	80.6414	12	224	1.9		
95134	121500	28.6027	80.6414	54	224	5.1	78	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	121500	28.6105	80.6069	6				75
95134	121500	28.6105	80.6069	60	191	6.0	79	
95134	121500	28.6057	80.6016	6			79	75
95134	121500	28.6057	80.6016	60	209	6.0	78	
95134	121500	28.6294	80.6235	6				74
95134	121500	28.6294	80.6235	60	216	6.0	78	
95134	121500	28.6248	80.6182	6			79	74
95134	121500	28.6248	80.6182	60	221	6.0	78	
95134	121500	28.4586	80.5923	6			78	
95134	121500	28.4586	80.5923	12	252	5.1		
95134	121500	28.4586	80.5923	54	242	6.0	77	
95134	121500	28.6062	80.6739	6			78	
95134	121500	28.6062	80.6739	12	205	2.9		
95134	121500	28.6062	80.6739	54	212	4.1	77	
95134	121500	28.6586	80.6998	6			77	
95134	121500	28.6586	80.6998	12	204	1.9		
95134	121500	28.6586	80.6998	54	0	0.0	78	
95134	121500	28.7055	80.7265	6			79	76
95134	121500	28.7055	80.7265	54	238	1.0		
95134	121500	28.7755	80.8043	6			82	77
95134	121500	28.7755	80.8043	54	237	5.1		
95134	121500	28.5158	80.6400	6			77	
95134	121500	28.5158	80.6400	12	229	2.9		
95134	121500	28.5158	80.6400	54	235	4.1	77	
95134	121500	28.5623	80.6694	6			77	
95134	121500	28.5623	80.6694	12	225	4.1		
95134	121500	28.5623	80.6694	54	218	5.1	77	
95134	121500	28.5986	80.6817	6				
95134	121500	28.5986	80.6817	30	207	5.1		
95134	121500	28.6160	80.6930	6			80	75
95134	121500	28.6160	80.6930	30	214	5.1		
95134	121500	28.6307	80.7027	6				
95134	121500	28.6307	80.7027	30	206	4.1		
95134	121500	28.6431	80.7482	6			78	
95134	121500	28.6431	80.7482	12	223	1.9		
95134	121500	28.6431	80.7482	54	214	2.9	77	
95134	121500	28.4632	80.6702	6			78	
95134	121500	28.4632	80.6702	12	229	1.9		
95134	121500	28.4632	80.6702	54	239	2.9	77	
95134	121500	28.5184	80.6962	6			77	
95134	121500	28.5184	80.6962	12	236	1.9		
95134	121500	28.5184	80.6962	54	228	4.1	76	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	121500	28.7464	80.8707	6			78	76
95134	121500	28.7464	80.8707	54	246	1.0		
95134	121500	28.4079	80.7604	6				
95134	121500	28.4079	80.7604	54				
95134	121500	28.5272	80.7742	6			78	75
95134	121500	28.5272	80.7742	54	220	4.1		
95134	121500	28.6056	80.8248	6				
95134	121500	28.6056	80.8248	54				
95134	121500	28.5697	80.5864	6			79	77
95134	121500	28.5697	80.5864	12	215	2.9		
95134	121500	28.5697	80.5864	54	219	6.0	78	
95134	121500	28.5697	80.5864	162	219	6.0		
95134	121500	28.5697	80.5864	204	219	6.0	78	
95134	121500	28.5697	80.5864	6			79	79
95134	121500	28.5697	80.5864	12	228	2.9		
95134	121500	28.5697	80.5864	54	222	6.0	78	
95134	121500	28.5697	80.5864	162	222	6.0		
95134	121500	28.5697	80.5864	204	224	7.0	77	
95134	121500	28.4843	80.7856	6			77	75
95134	121500	28.4843	80.7856	54	217	2.9		
95134	121500	28.6445	80.9034	6				
95134	121500	28.4114	80.9284	6			75	
95134	121500	28.4114	80.9284	54	250	1.0		
95134	121500	28.4475	80.8538	6				
95134	121500	28.4960	80.8843	6				
95134	121500	28.4960	80.8843	54				
95134	121500	28.5583	80.9132	6				
95134	121500	28.6173	80.9581	6			77	75
95134	121500	28.6173	80.9581	54	243	4.1		
95134	121500	28.6762	80.9987	6			77	76
95134	121500	28.6762	80.9987	54	203	1.9		
95134	121500	28.5231	81.0100	6			76	76
95134	121500	28.5231	81.0100	54	252	2.9		
95134	121500	28.6489	81.0693	6			74	64
95134	121500	28.6489	81.0693	54	206	1.9		
95134	121500	28.4417	81.0291	6			78	75
95134	121500	28.4417	81.0291	54	280	4.1		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	121500	28.6256	80.6571	6			79	76
95134	121500	28.6256	80.6571	12	200	1.9		
95134	121500	28.6256	80.6571	54	210	4.1	78	
95134	121500	28.6256	80.6571	162	215	5.1		
95134	121500	28.6256	80.6571	204	219	4.1	78	
95134	121500	28.6256	80.6571	295	223	5.1		
95134	121500	28.6256	80.6571	394	231	4.1		
95134	121500	28.6256	80.6571	492	250	6.0	78	
95134	121500	28.6256	80.6571	6			79	77
95134	121500	28.6256	80.6571	12	197	1.9		
95134	121500	28.6256	80.6571	54	211	4.1	79	
95134	121500	28.6256	80.6571	162	212	5.1		
95134	121500	28.6256	80.6571	204	223	5.1	77	
95134	121500	28.6256	80.6571	295	222	6.0		
95134	121500	28.6256	80.6571	394	237	6.0		
95134	121500	28.6256	80.6571	492	258	6.0	77	
95134	121500	28.3932	80.8211	6			76	75
95134	121500	28.3932	80.8211	54	259	1.0		
95134	121500	28.3382	80.7321	6			79	77
95134	121500	28.3382	80.7321	54	263	1.9		

METEOROLOGICAL TOWER DATA AT 13:15:00 ZULU TIME (T - 30 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	131500	28.4338	80.5734	6			81	
95134	131500	28.4338	80.5734	12	245	1.9		
95134	131500	28.4338	80.5734	54	255	4.1	80	
95134	131500	28.4598	80.5267	6			82	
95134	131500	28.4598	80.5267	12	243	2.9		
95134	131500	28.4598	80.5267	54	234	4.1	80	
95134	131500	28.4466	80.5652	6				
95134	131500	28.7435	80.7005	6			83	76
95134	131500	28.7435	80.7005	54	284	8.0		
95134	131500	28.7975	80.7378	6			83	75
95134	131500	28.7975	80.7378	54	306	7.0		
95134	131500	28.4721	80.5393	6				
95134	131500	28.4721	80.5393	90	249	4.1		
95134	131500	28.5622	80.5785	6				
95134	131500	28.5622	80.5785	54	286	2.9		
95134	131500	28.5836	80.5842	6				
95134	131500	28.5836	80.5842	54	272	2.9		
95134	131500	28.5130	80.5613	6			81	78
95134	131500	28.5130	80.5613	12	249	1.9		
95134	131500	28.5130	80.5613	54	255	4.1	80	
95134	131500	28.5130	80.5613	162	255	5.1		
95134	131500	28.5130	80.5613	204	250	5.1	79	
95134	131500	28.5130	80.5613	6			81	76
95134	131500	28.5130	80.5613	12	247	2.9		
95134	131500	28.5130	80.5613	54	248	4.1	80	
95134	131500	28.5130	80.5613	162	255	5.1		
95134	131500	28.5130	80.5613	204	257	5.1	79	
95134	131500	28.5358	80.5747	6			80	
95134	131500	28.5358	80.5747	12	262	2.9		
95134	131500	28.5358	80.5747	54	256	4.1	79	
95134	131500	28.6141	80.6203	6			81	
95134	131500	28.6141	80.6203	12	263	4.1		
95134	131500	28.6141	80.6203	54	256	5.1	80	
95134	131500	28.4048	80.6519	6			80	78
95134	131500	28.4048	80.6519	54	249	4.1		
95134	131500	28.4600	80.5711	6			81	
95134	131500	28.4600	80.5711	12	252	2.9		
95134	131500	28.4600	80.5711	54	253	5.1	79	
95134	131500	28.6027	80.6414	6			81	
95134	131500	28.6027	80.6414	12	289	1.9		
95134	131500	28.6027	80.6414	54	271	2.9	80	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	131500	28.6105	80.6069	6				76
95134	131500	28.6105	80.6069	60	235	6.0	81	
95134	131500	28.6057	80.6016	6			81	76
95134	131500	28.6057	80.6016	60	262	6.0	80	
95134	131500	28.6294	80.6235	6				75
95134	131500	28.6294	80.6235	60	267	5.1	81	
95134	131500	28.6248	80.6182	6			81	75
95134	131500	28.6248	80.6182	60	272	5.1	81	
95134	131500	28.4586	80.5923	6			80	
95134	131500	28.4586	80.5923	12	264	4.1		
95134	131500	28.4586	80.5923	54	257	4.1	79	
95134	131500	28.6062	80.6739	6			80	
95134	131500	28.6062	80.6739	12	258	2.9		
95134	131500	28.6062	80.6739	54	269	4.1	80	
95134	131500	28.6586	80.6998	6			82	
95134	131500	28.6586	80.6998	12	284	1.9		
95134	131500	28.6586	80.6998	54	269	2.9	83	
95134	131500	28.7055	80.7265	6			82	75
95134	131500	28.7055	80.7265	54	278	5.1		
95134	131500	28.7755	80.8043	6			81	76
95134	131500	28.7755	80.8043	54	299	7.0		
95134	131500	28.5158	80.6400	6			81	
95134	131500	28.5158	80.6400	12	293	2.9		
95134	131500	28.5158	80.6400	54	287	4.1	80	
95134	131500	28.5623	80.6694	6			81	
95134	131500	28.5623	80.6694	12	267	2.9		
95134	131500	28.5623	80.6694	54	272	4.1	79	
95134	131500	28.5986	80.6817	6				
95134	131500	28.5986	80.6817	30	270	4.1		
95134	131500	28.6160	80.6930	6			83	76
95134	131500	28.6160	80.6930	30	290	4.1		
95134	131500	28.6307	80.7027	6				
95134	131500	28.6307	80.7027	30	292	5.1		
95134	131500	28.6431	80.7482	6			82	
95134	131500	28.6431	80.7482	12	260	1.9		
95134	131500	28.6431	80.7482	54	267	5.1	80	
95134	131500	28.4632	80.6702	6			81	
95134	131500	28.4632	80.6702	12	276	1.9		
95134	131500	28.4632	80.6702	54	269	2.9	80	
95134	131500	28.5184	80.6962	6			80	
95134	131500	28.5184	80.6962	12	282	1.9		
95134	131500	28.5184	80.6962	54	282	2.9	79	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	131500	28.7464	80.8707	6			82	76
95134	131500	28.7464	80.8707	54	314	4.1		
95134	131500	28.4079	80.7604	6				
95134	131500	28.4079	80.7604	54				
95134	131500	28.5272	80.7742	6			81	76
95134	131500	28.5272	80.7742	54	292	6.0		
95134	131500	28.6056	80.8248	6				
95134	131500	28.6056	80.8248	54				
95134	131500	28.5697	80.5864	6			82	78
95134	131500	28.5697	80.5864	12	283	1.9		
95134	131500	28.5697	80.5864	54	284	5.1	80	
95134	131500	28.5697	80.5864	162	284	5.1		
95134	131500	28.5697	80.5864	204	282	5.1	80	
95134	131500	28.5697	80.5864	6			83	80
95134	131500	28.5697	80.5864	12	289	1.9		
95134	131500	28.5697	80.5864	54	283	4.1	81	
95134	131500	28.5697	80.5864	162	285	4.1		
95134	131500	28.5697	80.5864	204	285	4.1	80	
95134	131500	28.4843	80.7856	6			83	76
95134	131500	28.4843	80.7856	54	309	4.1		
95134	131500	28.6445	80.9034	6				
95134	131500	28.4114	80.9284	6			83	77
95134	131500	28.4114	80.9284	54	294	5.1		
95134	131500	28.4475	80.8538	6				
95134	131500	28.4960	80.8843	6				
95134	131500	28.4960	80.8843	54				
95134	131500	28.5583	80.9132	6				
95134	131500	28.6173	80.9581	6			83	75
95134	131500	28.6173	80.9581	54	307	4.1		
95134	131500	28.6762	80.9987	6			82	76
95134	131500	28.6762	80.9987	54	317	6.0		
95134	131500	28.5231	81.0100	6			83	74
95134	131500	28.5231	81.0100	54	294	4.1		
95134	131500	28.6489	81.0693	6				
95134	131500	28.6489	81.0693	54				
95134	131500	28.4417	81.0291	6			84	74
95134	131500	28.4417	81.0291	54	315	6.0		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	131500	28.6256	80.6571	6			82	76
95134	131500	28.6256	80.6571	12	275	2.9		
95134	131500	28.6256	80.6571	54	277	4.1	80	
95134	131500	28.6256	80.6571	162	274	4.1		
95134	131500	28.6256	80.6571	204	274	5.1	80	
95134	131500	28.6256	80.6571	295	277	5.1		
95134	131500	28.6256	80.6571	394	277	5.1		
95134	131500	28.6256	80.6571	492	280	5.1	78	
95134	131500	28.6256	80.6571	6			82	78
95134	131500	28.6256	80.6571	12	282	1.9		
95134	131500	28.6256	80.6571	54	279	4.1	81	
95134	131500	28.6256	80.6571	162	275	4.1		
95134	131500	28.6256	80.6571	204	284	4.1	80	
95134	131500	28.6256	80.6571	295	278	5.1		
95134	131500	28.6256	80.6571	394	289	5.1		
95134	131500	28.6256	80.6571	492	289	5.1	78	
95134	131500	28.3932	80.8211	6			81	75
95134	131500	28.3932	80.8211	54	287	5.1		
95134	131500	28.3382	80.7321	6			84	78
95134	131500	28.3382	80.7321	54	265	2.9		

METEOROLOGICAL TOWER DATA AT 13:40:00 ZULU TIME (T - 5 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134000	28.4338	80.5734	6			82	
95134	134000	28.4338	80.5734	12	267	1.9		
95134	134000	28.4338	80.5734	54	274	4.1	80	
95134	134000	28.4598	80.5267	6			83	
95134	134000	28.4598	80.5267	12	266	2.9		
95134	134000	28.4598	80.5267	54	261	4.1	81	
95134	134000	28.4466	80.5652	6				
95134	134000	28.7435	80.7005	6			85	77
95134	134000	28.7435	80.7005	54	317	5.1		
95134	134000	28.7975	80.7378	6			84	76
95134	134000	28.7975	80.7378	54	322	6.0		
95134	134000	28.4721	80.5393	6				
95134	134000	28.4721	80.5393	90	284	4.1		
95134	134000	28.5622	80.5785	6				
95134	134000	28.5622	80.5785	54	300	2.9		
95134	134000	28.5836	80.5842	6				
95134	134000	28.5836	80.5842	54	283	2.9		
95134	134000	28.5130	80.5613	6			82	79
95134	134000	28.5130	80.5613	12	266	1.9		
95134	134000	28.5130	80.5613	54	288	2.9	81	
95134	134000	28.5130	80.5613	162	280	4.1		
95134	134000	28.5130	80.5613	204	277	4.1	80	
95134	134000	28.5130	80.5613	6			82	77
95134	134000	28.5130	80.5613	12	259	1.9		
95134	134000	28.5130	80.5613	54	272	2.9	82	
95134	134000	28.5130	80.5613	162	275	4.1		
95134	134000	28.5130	80.5613	204	280	4.1	80	
95134	134000	28.5358	80.5747	6			82	
95134	134000	28.5358	80.5747	12	279	1.9		
95134	134000	28.5358	80.5747	54	272	2.9	80	
95134	134000	28.6141	80.6203	6			83	
95134	134000	28.6141	80.6203	12	293	1.9		
95134	134000	28.6141	80.6203	54	284	2.9	82	
95134	134000	28.4048	80.6519	6			82	77
95134	134000	28.4048	80.6519	54	285	6.0		
95134	134000	28.4600	80.5711	6			82	
95134	134000	28.4600	80.5711	12	289	1.9		
95134	134000	28.4600	80.5711	54	285	2.9	81	
95134	134000	28.6027	80.6414	6			82	
95134	134000	28.6027	80.6414	12	290	1.9		
95134	134000	28.6027	80.6414	54	285	2.9	81	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134000	28.6105	80.6069	6				77
95134	134000	28.6105	80.6069	60	249	4.1	83	
95134	134000	28.6057	80.6016	6			83	77
95134	134000	28.6057	80.6016	60	253	5.1	82	
95134	134000	28.6294	80.6235	6				75
95134	134000	28.6294	80.6235	60	290	5.1	82	
95134	134000	28.6248	80.6182	6			83	75
95134	134000	28.6248	80.6182	60	295	5.1	83	
95134	134000	28.4586	80.5923	6			81	
95134	134000	28.4586	80.5923	12	262	4.1		
95134	134000	28.4586	80.5923	54	256	4.1	80	
95134	134000	28.6062	80.6739	6			82	
95134	134000	28.6062	80.6739	12	282	1.9		
95134	134000	28.6062	80.6739	54	295	4.1	81	
95134	134000	28.6586	80.6998	6			83	
95134	134000	28.6586	80.6998	12	311	2.9		
95134	134000	28.6586	80.6998	54	314	5.1	85	
95134	134000	28.7055	80.7265	6			83	76
95134	134000	28.7055	80.7265	54	290	4.1		
95134	134000	28.7755	80.8043	6			83	76
95134	134000	28.7755	80.8043	54	293	7.0		
95134	134000	28.5158	80.6400	6			82	
95134	134000	28.5158	80.6400	12	299	4.1		
95134	134000	28.5158	80.6400	54	292	5.1	81	
95134	134000	28.5623	80.6694	6			82	
95134	134000	28.5623	80.6694	12	292	2.9		
95134	**134000**	**28.5623**	**80.6694**	**54**	**293**	**4.1**	**80**	
95134	134000	28.5986	80.6817	6				
95134	134000	28.5986	80.6817	30	252	4.1		
95134	134000	28.6160	80.6930	6			84	75
95134	134000	28.6160	80.6930	30	288	6.0		
95134	134000	28.6307	80.7027	6				
95134	134000	28.6307	80.7027	30	291	6.0		
95134	134000	28.6431	80.7482	6			83	
95134	134000	28.6431	80.7482	12	312	1.9		
95134	134000	28.6431	80.7482	54	302	5.1	80	
95134	134000	28.4632	80.6702	6			82	
95134	134000	28.4632	80.6702	12	324	2.9		
95134	134000	28.4632	80.6702	54	307	2.9	81	
95134	134000	28.5184	80.6962	6			81	
95134	134000	28.5184	80.6962	12	289	4.1		
95134	134000	28.5184	80.6962	54	284	6.0	80	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134000	28.7464	80.8707	6			84	75
95134	134000	28.7464	80.8707	54	310	5.1		
95134	134000	28.4079	80.7604	6				
95134	134000	28.4079	80.7604	54				
95134	134000	28.5272	80.7742	6			83	76
95134	134000	28.5272	80.7742	54	286	5.1		
95134	134000	28.6056	80.8248	6				
95134	134000	28.6056	80.8248	54				
95134	134000	28.5697	80.5864	6			83	79
95134	134000	28.5697	80.5864	12	296	1.9		
95134	134000	28.5697	80.5864	54	298	5.1	82	
95134	134000	28.5697	80.5864	162	298	5.1		
95134	134000	28.5697	80.5864	204	295	5.1	81	
95134	134000	28.5697	80.5864	6			84	80
95134	134000	28.5697	80.5864	12	298	1.9		
95134	134000	28.5697	80.5864	54	294	4.1	82	
95134	134000	28.5697	80.5864	162	295	4.1		
95134	134000	28.5697	80.5864	204	296	4.1	81	
95134	134000	28.4843	80.7856	6			84	76
95134	134000	28.4843	80.7856	54	303	5.1		
95134	134000	28.6445	80.9034	6				
95134	134000	28.4114	80.9284	6			85	76
95134	134000	28.4114	80.9284	54	328	6.0		
95134	134000	28.4475	80.8538	6				
95134	134000	28.4960	80.8843	6				
95134	134000	28.4960	80.8843	54				
95134	**134000**	**28.5583**	**80.9132**	**6**				
95134	134000	28.6173	80.9581	6			85	75
95134	134000	28.6173	80.9581	54	310	5.1		
95134	134000	28.6762	80.9987	6			84	75
95134	134000	28.6762	80.9987	54	317	4.1		
95134	**134000**	28.5231	81.0100	6			**84**	72
95134	134000	28.5231	81.0100	54	310	5.1		
95134	**134000**	28.6489	81.0693	6			90	72
95134	134000	28.6489	81.0693	54	334	4.1		
95134	134000	28.4417	81.0291	6			85	73
95134	134000	28.4417	81.0291	54	330	7.0		
95134	134000	28.6256	80.6571	6			83	76
95134	134000	28.6256	80.6571	12	309	1.9		
95134	134000	28.6256	80.6571	54	290	4.1	82	
95134	134000	28.6256	80.6571	162	287	5.1		
95134	134000	28.6256	80.6571	204	289	5.1	81	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134000	28.6256	80.6571	295	287	5.1		
95134	134000	28.6256	80.6571	394	286	5.1		
95134	134000	28.6256	80.6571	492	288	5.1	79	
95134	134000	28.6256	80.6571	6			83	77
95134	134000	28.6256	80.6571	12	316	1.9		
95134	134000	28.6256	80.6571	54	296	4.1	83	
95134	134000	28.6256	80.6571	162	293	5.1		
95134	134000	28.6256	80.6571	204	298	5.1	81	
95134	134000	28.6256	80.6571	295	290	5.1		
95134	134000	28.6256	80.6571	394	297	5.1		
95134	134000	28.6256	80.6571	492	298	5.1	80	
95134	134000	28.3932	80.8211	6			83	75
95134	134000	28.3932	80.8211	54	296	7.0		
95134	134000	28.3382	80.7321	6			87	79
95134	134000	28.3382	80.7321	54	284	2.9		

METEOROLOGICAL TOWER DATA AT 13:45:00 ZULU TIME (T + 0 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134500	28.4338	80.5734	6			82	
95134	134500	28.4338	80.5734	12	270	1.9		
95134	134500	28.4338	80.5734	54	278	4.1	81	
95134	134500	28.4598	80.5267	6			83	
95134	134500	28.4598	80.5267	12	280	4.1		
95134	134500	28.4598	80.5267	54	273	4.1	82	
95134	134500	28.4466	80.5652	6				
95134	134500	28.7435	80.7005	6			85	77
95134	134500	28.7435	80.7005	54	314	7.0		
95134	134500	28.7975	80.7378	6			84	76
95134	134500	28.7975	80.7378	54	322	6.0		
95134	134500	28.4721	80.5393	6				
95134	134500	28.4721	80.5393	90	268	5.1		
95134	134500	28.5622	80.5785	6				
95134	134500	28.5622	80.5785	54	300	4.1		
95134	134500	28.5836	80.5842	6				
95134	134500	28.5836	80.5842	54	280	4.1		
95134	134500	28.5130	80.5613	6			83	79
95134	134500	28.5130	80.5613	12	292	1.9		
95134	134500	28.5130	80.5613	54	290	2.9	82	
95134	134500	28.5130	80.5613	162	297	4.1		
95134	134500	28.5130	80.5613	204	288	4.1	80	
95134	134500	28.5130	80.5613	6			83	77
95134	134500	28.5130	80.5613	12	280	1.9		
95134	134500	28.5130	80.5613	54	283	1.9	82	
95134	134500	28.5130	80.5613	162	294	4.1		
95134	134500	28.5130	80.5613	204	293	4.1	80	
95134	134500	28.5358	80.5747	6			82	
95134	134500	28.5358	80.5747	12	280	2.9		
95134	134500	28.5358	80.5747	54	273	4.1	81	
95134	134500	28.6141	80.6203	6			83	
95134	134500	28.6141	80.6203	12	294	1.9		
95134	134500	28.6141	80.6203	54	282	4.1	82	
95134	134500	28.4048	80.6519	6			82	77
95134	134500	28.4048	80.6519	54	288	7.0		
95134	134500	28.4600	80.5711	6			83	
95134	134500	28.4600	80.5711	12	265	2.9		
95134	134500	28.4600	80.5711	54	271	4.1	81	
95134	134500	28.6027	80.6414	6			83	
95134	134500	28.6027	80.6414	12	302	1.0		
95134	134500	28.6027	80.6414	54	292	1.9	82	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134500	28.6105	80.6069	6				78
95134	134500	28.6105	80.6069	60	254	4.1	84	
95134	134500	28.6057	80.6016	6			83	77
95134	134500	28.6057	80.6016	60	252	5.1	82	
95134	134500	28.6294	80.6235	6				75
95134	134500	28.6294	80.6235	60	287	5.1	83	
95134	134500	28.6248	80.6182	6			83	75
95134	134500	28.6248	80.6182	60	280	5.1	83	
95134	134500	28.4586	80.5923	6			82	
95134	134500	28.4586	80.5923	12	278	2.9		
95134	134500	28.4586	80.5923	54	269	2.9	80	
95134	134500	28.6062	80.6739	6			83	
95134	134500	28.6062	80.6739	12	268	1.9		
95134	134500	28.6062	80.6739	54	297	1.9	82	
95134	134500	28.6586	80.6998	6			83	
95134	134500	28.6586	80.6998	12	289	2.9		
95134	134500	28.6586	80.6998	54	292	4.1	85	
95134	134500	28.7055	80.7265	6			83	76
95134	134500	28.7055	80.7265	54	284	5.1		
95134	134500	28.7755	80.8043	6			83	76
95134	134500	28.7755	80.8043	54	295	8.0		
95134	134500	28.5158	80.6400	6			82	
95134	134500	28.5158	80.6400	12	290	2.9		
95134	134500	28.5158	80.6400	54	282	4.1	81	
95134	134500	28.5623	80.6694	6			82	
95134	134500	28.5623	80.6694	12	313	2.9		
95134	134500	28.5623	80.6694	54	301	4.1	80	
95134	134500	28.5986	80.6817	6				
95134	134500	28.5986	80.6817	30	294	4.1		
95134	134500	28.6160	80.6930	6			85	75
95134	134500	28.6160	80.6930	30	307	6.0		
95134	134500	28.6307	80.7027	6				
95134	134500	28.6307	80.7027	30	289	6.0		
95134	134500	28.6431	80.7482	6			83	
95134	134500	28.6431	80.7482	12	317	2.9		
95134	134500	28.6431	80.7482	54	306	5.1	80	
95134	134500	28.4632	80.6702	6			83	
95134	134500	28.4632	80.6702	12	312	1.9		
95134	134500	28.4632	80.6702	54	289	2.9	81	
95134	134500	28.5184	80.6962	6			82	
95134	134500	28.5184	80.6962	12	283	4.1		
95134	134500	28.5184	80.6962	54	279	5.1	80	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134500	28.7464	80.8707	6			84	75
95134	134500	28.7464	80.8707	54	300	5.1		
95134	134500	28.4079	80.7604	6				
95134	134500	28.4079	80.7604	54				
95134	134500	28.5272	80.7742	6			83	76
95134	134500	28.5272	80.7742	54	288	5.1		
95134	134500	28.6056	80.8248	6				
95134	134500	28.6056	80.8248	54				
95134	134500	28.5697	80.5864	6			84	79
95134	134500	28.5697	80.5864	12	296	2.9		
95134	134500	28.5697	80.5864	54	298	5.1	82	
95134	134500	28.5697	80.5864	162	300	5.1		
95134	134500	28.5697	80.5864	204	298	5.1	81	
95134	134500	28.5697	80.5864	6			84	80
95134	134500	28.5697	80.5864	12	300	1.9		
95134	134500	28.5697	80.5864	54	294	5.1	82	
95134	134500	28.5697	80.5864	162	298	5.1		
95134	134500	28.5697	80.5864	204	299	5.1	81	
95134	134500	28.4843	80.7856	6			84	76
95134	134500	28.4843	80.7856	54	287	2.9		
95134	134500	28.6445	80.9034	6				
95134	134500	28.4114	80.9284	6			85	76
95134	134500	28.4114	80.9284	54	336	6.0		
95134	134500	28.4475	80.8538	6				
95134	134500	28.4960	80.8843	6				
95134	134500	28.4960	80.8843	54				
95134	134500	28.5583	80.9132	6				
95134	134500	28.6173	80.9581	6				
95134	134500	28.6173	80.9581	54				
95134	134500	28.6762	80.9987	6			84	75
95134	134500	28.6762	80.9987	54	302	4.1		
95134	134500	28.5231	81.0100	6			84	72
95134	134500	28.5231	81.0100	54	298	5.1		
95134	134500	28.6489	81.0693	6			88	59
95134	134500	28.6489	81.0693	54	323	5.1		
95134	134500	28.4417	81.0291	6			85	73
95134	134500	28.4417	81.0291	54	327	6.0		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	134500	28.6256	80.6571	6			84	76
95134	134500	28.6256	80.6571	12	281	1.9		
95134	134500	28.6256	80.6571	54	292	4.1	82	
95134	134500	28.6256	80.6571	162	294	5.1		
95134	134500	28.6256	80.6571	204	298	5.1	81	
95134	134500	28.6256	80.6571	295	308	5.1		
95134	134500	28.6256	80.6571	394	302	6.0		
95134	134500	28.6256	80.6571	492	298	6.0	79	
95134	134500	28.6256	80.6571	6			84	78
95134	134500	28.6256	80.6571	12	286	2.9		
95134	134500	28.6256	80.6571	54	295	4.1	83	
95134	134500	28.6256	80.6571	162	300	5.1		
95134	134500	28.6256	80.6571	204	307	5.1	81	
95134	134500	28.6256	80.6571	295	314	5.1		
95134	134500	28.6256	80.6571	394	314	6.0		
95134	134500	28.6256	80.6571	492	307	6.0	80	
95134	134500	28.3932	80.8211	6			83	75
95134	134500	28.3932	80.8211	54	302	7.0		
95134	134500	28.3382	80.7321	6			87	79
95134	134500	28.3382	80.7321	54	288	2.9		

METEOROLOGICAL TOWER DATA AT 13:50:00 ZULU TIME (T + 5 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	135000	28.4338	80.5734	6			83	
95134	135000	28.4338	80.5734	12	255	2.9		
95134	135000	28.4338	80.5734	54	272	4.1	81	
95134	135000	28.4598	80.5267	6			83	
95134	135000	28.4598	80.5267	12	279	4.1		
95134	135000	28.4598	80.5267	54	271	5.1	82	
95134	135000	28.4466	80.5652	6				
95134	135000	28.7435	80.7005	6			85	77
95134	135000	28.7435	80.7005	54	319	6.0		
95134	135000	28.7975	80.7378	6			84	76
95134	135000	28.7975	80.7378	54	317	7.0		
95134	135000	28.4721	80.5393	6				
95134	135000	28.4721	80.5393	90	266	5.1		
95134	135000	28.5622	80.5785	6				
95134	135000	28.5622	80.5785	54	286	5.1		
95134	135000	28.5836	80.5842	6				
95134	135000	28.5836	80.5842	54	279	4.1		
95134	135000	28.5130	80.5613	6			83	79
95134	135000	28.5130	80.5613	12	274	1.9		
95134	135000	28.5130	80.5613	54	293	4.1	82	
95134	135000	28.5130	80.5613	162	297	5.1		
95134	135000	28.5130	80.5613	204	290	5.1	80	
95134	135000	28.5130	80.5613	6			83	77
95134	135000	28.5130	80.5613	12	273	1.9		
95134	135000	28.5130	80.5613	54	283	2.9	82	
95134	135000	28.5130	80.5613	162	295	4.1		
95134	135000	28.5130	80.5613	204	295	5.1	80	
95134	135000	28.5358	80.5747	6			83	
95134	135000	28.5358	80.5747	12	279	2.9		
95134	135000	28.5358	80.5747	54	279	4.1	81	
95134	135000	28.6141	80.6203	6			83	
95134	135000	28.6141	80.6203	12	274	2.9		
95134	135000	28.6141	80.6203	54	275	4.1	82	
95134	135000	28.4048	80.6519	6			83	77
95134	135000	28.4048	80.6519	54	306	7.0		
95134	135000	28.4600	80.5711	6			83	
95134	135000	28.4600	80.5711	12	267	2.9		
95134	135000	28.4600	80.5711	54	274	4.1	81	
95134	135000	28.6027	80.6414	6			83	
95134	135000	28.6027	80.6414	12	299	2.9		
95134	135000	28.6027	80.6414	54	290	2.9	82	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	135000	28.6105	80.6069	6				78
95134	135000	28.6105	80.6069	60	262	5.1	84	
95134	135000	28.6057	80.6016	6			83	77
95134	135000	28.6057	80.6016	60	251	6.0	82	
95134	135000	28.6294	80.6235	6				75
95134	135000	28.6294	80.6235	60	288	6.0	83	
95134	135000	28.6248	80.6182	6			83	75
95134	135000	28.6248	80.6182	60	279	5.1	83	
95134	135000	28.4586	80.5923	6			82	
95134	135000	28.4586	80.5923	12	286	4.1		
95134	135000	28.4586	80.5923	54	279	4.1	81	
95134	135000	28.6062	80.6739	6			83	
95134	135000	28.6062	80.6739	12	259	2.9		
95134	135000	28.6062	80.6739	54	268	4.1	82	
95134	135000	28.6586	80.6998	6			83	
95134	135000	28.6586	80.6998	12	289	2.9		
95134	135000	28.6586	80.6998	54	288	4.1	85	
95134	135000	28.7055	80.7265	6			83	76
95134	135000	28.7055	80.7265	54	290	4.1		
95134	135000	28.7755	80.8043	6			83	76
95134	135000	28.7755	80.8043	54	288	7.0		
95134	135000	28.5158	80.6400	6			83	
95134	135000	28.5158	80.6400	12	286	2.9		
95134	135000	28.5158	80.6400	54	294	4.1	82	
95134	135000	28.5623	80.6694	6			82	
95134	135000	28.5623	80.6694	12	315	2.9		
95134	135000	28.5623	80.6694	54	305	4.1	81	
95134	135000	28.5986	80.6817	6				
95134	135000	28.5986	80.6817	30	298	6.0		
95134	135000	28.6160	80.6930	6			85	75
95134	135000	28.6160	80.6930	30	302	6.0		
95134	135000	28.6307	80.7027	6				
95134	135000	28.6307	80.7027	30	306	6.0		
95134	135000	28.6431	80.7482	6			83	
95134	135000	28.6431	80.7482	12	324	2.9		
95134	135000	28.6431	80.7482	54	318	6.0	80	
95134	135000	28.4632	80.6702	6			83	
95134	135000	28.4632	80.6702	12	304	1.9		
95134	135000	28.4632	80.6702	54	286	2.9	82	
95134	135000	28.5184	80.6962	6			82	
95134	135000	28.5184	80.6962	12	289	2.9		
95134	135000	28.5184	80.6962	54	280	5.1	81	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	135000	28.7464	80.8707	6			84	74
95134	135000	28.7464	80.8707	54	318	5.1		
95134	135000	28.4079	80.7604	6				
95134	135000	28.4079	80.7604	54				
95134	135000	28.5272	80.7742	6			84	76
95134	135000	28.5272	80.7742	54	274	4.1		
95134	135000	28.6056	80.8248	6				
95134	135000	28.6056	80.8248	54				
95134	135000	28.5697	80.5864	6			84	79
95134	135000	28.5697	80.5864	12	295	2.9		
95134	135000	28.5697	80.5864	54	298	6.0	82	
95134	135000	28.5697	80.5864	162	297	6.0		
95134	135000	28.5697	80.5864	204	295	6.0	81	
95134	135000	28.5697	80.5864	6			84	80
95134	135000	28.5697	80.5864	12	300	1.9		
95134	135000	28.5697	80.5864	54	294	5.1	82	
95134	135000	28.5697	80.5864	162	295	5.1		
95134	135000	28.5697	80.5864	204	296	5.1	81	
95134	135000	28.4843	80.7856	6			85	76
95134	135000	28.4843	80.7856	54	306	4.1		
95134	135000	28.6445	80.9034	6				
95134	135000	28.4114	80.9284	6			85	76
95134	135000	28.4114	80.9284	54	313	5.1		
95134	135000	28.4475	80.8538	6				
95134	135000	28.4960	80.8843	6				
95134	135000	28.4960	80.8843	54				
95134	135000	28.5583	80.9132	6				
95134	135000	28.6173	80.9581	6			85	73
95134	135000	28.6173	80.9581	54	310	6.0		
95134	135000	28.6762	80.9987	6			85	75
95134	135000	28.6762	80.9987	54	325	5.1		
95134	135000	28.5231	81.0100	6			85	72
95134	135000	28.5231	81.0100	54	297	5.1		
95134	135000	28.6489	81.0693	6			89	60
95134	135000	28.6489	81.0693	54	325	4.1		
95134	135000	28.4417	81.0291	6			86	73
95134	135000	28.4417	81.0291	54	330	5.1		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	135000	28.6256	80.6571	6			84	76
95134	135000	28.6256	80.6571	12	284	2.9		
95134	135000	28.6256	80.6571	54	282	4.1	83	
95134	135000	28.6256	80.6571	162	287	5.1		
95134	135000	28.6256	80.6571	204	288	6.0	81	
95134	135000	28.6256	80.6571	295	297	6.0		
95134	135000	28.6256	80.6571	394	295	7.0		
95134	135000	28.6256	80.6571	492	290	6.0	80	
95134	135000	28.6256	80.6571	6			84	77
95134	135000	28.6256	80.6571	12	289	2.9		
95134	135000	28.6256	80.6571	54	290	4.1	83	
95134	135000	28.6256	80.6571	162	292	5.1		
95134	135000	28.6256	80.6571	204	299	5.1	81	
95134	135000	28.6256	80.6571	295	301	6.0		
95134	135000	28.6256	80.6571	394	306	6.0		
95134	135000	28.6256	80.6571	492	300	7.0	80	
95134	135000	28.3932	80.8211	6			84	74
95134	135000	28.3932	80.8211	54	317	7.0		
95134	135000	28.3382	80.7321	6			88	79
95134	135000	28.3382	80.7321	54	287	2.9		

METEOROLOGICAL TOWER DATA AT 14:15:00 ZULU TIME (T + 30 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	141500	28.4338	80.5734	6			83	
95134	141500	28.4338	80.5734	12	299	4.1		
95134	141500	28.4338	80.5734	54	305	6.0	82	
95134	141500	28.4598	80.5267	6			84	
95134	141500	28.4598	80.5267	12	295	4.1		
95134	141500	28.4598	80.5267	54	292	5.1	82	
95134	141500	28.4466	80.5652	6				
95134	141500	28.7435	80.7005	6			82	77
95134	141500	28.7435	80.7005	54	348	8.0		
95134	141500	28.7975	80.7378	6			85	76
95134	141500	28.7975	80.7378	54	325	6.0		
95134	141500	28.4721	80.5393	6				
95134	141500	28.4721	80.5393	90	287	6.0		
95134	141500	28.5622	80.5785	6				
95134	141500	28.5622	80.5785	54	299	4.1		
95134	141500	28.5836	80.5842	6				
95134	141500	28.5836	80.5842	54	280	4.1		
95134	141500	28.5130	80.5613	6			84	79
95134	141500	28.5130	80.5613	12	258	2.9		
95134	141500	28.5130	80.5613	54	280	5.1	83	
95134	141500	28.5130	80.5613	162	285	7.0		
95134	141500	28.5130	80.5613	204	280	7.0	81	
95134	141500	28.5130	80.5613	6			84	77
95134	141500	28.5130	80.5613	12	256	2.9		
95134	141500	28.5130	80.5613	54	274	4.1	83	
95134	141500	28.5130	80.5613	162	284	6.0		
95134	141500	28.5130	80.5613	204	286	7.0	81	
95134	141500	28.5358	80.5747	6			84	
95134	141500	28.5358	80.5747	12	289	2.9		
95134	141500	28.5358	80.5747	54	288	5.1	82	
95134	141500	28.6141	80.6203	6			84	
95134	141500	28.6141	80.6203	12	320	4.1		
95134	141500	28.6141	80.6203	54	313	5.1	83	
95134	141500	28.4048	80.6519	6			85	76
95134	141500	28.4048	80.6519	54	303	7.0		
95134	141500	28.4600	80.5711	6			84	
95134	141500	28.4600	80.5711	12	305	1.9		
95134	141500	28.4600	80.5711	54	293	2.9	82	
95134	141500	28.6027	80.6414	6			85	
95134	141500	28.6027	80.6414	12	305	2.9		
95134	141500	28.6027	80.6414	54	299	4.1	83	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	141500	28.6105	80.6069	6				77
95134	141500	28.6105	80.6069	60	273	7.0	85	
95134	141500	28.6057	80.6016	6			85	77
95134	141500	28.6057	80.6016	60	282	6.0	84	
95134	141500	28.6294	80.6235	6				75
95134	141500	28.6294	80.6235	60	331	8.9	83	
95134	141500	28.6248	80.6182	6			84	75
95134	141500	28.6248	80.6182	60	328	8.0	84	
95134	141500	28.4586	80.5923	6			84	
95134	141500	28.4586	80.5923	12	311	4.1		
95134	141500	28.4586	80.5923	54	296	5.1	82	
95134	141500	28.6062	80.6739	6			84	
95134	141500	28.6062	80.6739	12	305	1.9		
95134	141500	28.6062	80.6739	54	313	5.1	83	
95134	141500	28.6586	80.6998	6			84	
95134	141500	28.6586	80.6998	12	308	4.1		
95134	141500	28.6586	80.6998	54	315	5.1	85	
95134	141500	28.7055	80.7265	6			85	76
95134	141500	28.7055	80.7265	54	294	4.1		
95134	141500	28.7755	80.8043	6			85	75
95134	141500	28.7755	80.8043	54	288	7.0		
95134	141500	28.5158	80.6400	6			83	
95134	141500	28.5158	80.6400	12	315	4.1		
95134	141500	28.5158	80.6400	54	310	4.1	82	
95134	141500	28.5623	80.6694	6			83	
95134	141500	28.5623	80.6694	12	289	2.9		
95134	141500	28.5623	80.6694	54	291	4.1	82	
95134	141500	28.5986	80.6817	6				
95134	141500	28.5986	80.6817	30	313	7.0		
95134	141500	28.6160	80.6930	6			86	75
95134	141500	28.6160	80.6930	30	307	7.0		
95134	141500	28.6307	80.7027	6				
95134	141500	28.6307	80.7027	30	311	6.0		
95134	141500	28.6431	80.7482	6			84	
95134	141500	28.6431	80.7482	12	326	2.9		
95134	141500	28.6431	80.7482	54	309	6.0	82	
95134	141500	28.4632	80.6702	6			85	
95134	141500	28.4632	80.6702	12	295	1.9		
95134	141500	28.4632	80.6702	54	276	2.9	83	
95134	141500	28.5184	80.6962	6			83	
95134	141500	28.5184	80.6962	12	308	2.9		
95134	141500	28.5184	80.6962	54	312	4.1	82	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	141500	28.7464	80.8707	6			86	73
95134	141500	28.7464	80.8707	54	292	5.1		
95134	141500	28.4079	80.7604	6				
95134	141500	28.4079	80.7604	54				
95134	141500	28.5272	80.7742	6				
95134	141500	28.5272	80.7742	54				
95134	141500	28.6056	80.8248	6				
95134	141500	28.6056	80.8248	54				
95134	141500	28.5697	80.5864	6			85	79
95134	141500	28.5697	80.5864	12	302	2.9		
95134	141500	28.5697	80.5864	54	304	5.1	83	
95134	141500	28.5697	80.5864	162	301	5.1		
95134	141500	28.5697	80.5864	204	298	5.1	82	
95134	141500	28.5697	80.5864	6			85	80
95134	141500	28.5697	80.5864	12	304	1.9		
95134	141500	28.5697	80.5864	54	300	4.1	82	
95134	141500	28.5697	80.5864	162	299	5.1		
95134	141500	28.5697	80.5864	204	299	5.1	81	
95134	141500	28.4843	80.7856	6			87	76
95134	141500	28.4843	80.7856	54	290	5.1		
95134	141500	28.6445	80.9034	6				
95134	141500	28.4114	80.9284	6			86	76
95134	141500	28.4114	80.9284	54	297	5.1		
95134	141500	28.4475	80.8538	6				
95134	141500	28.4960	80.8843	6				
95134	141500	28.4960	80.8843	54				
95134	141500	28.5583	80.9132	6				
95134	141500	28.6173	80.9581	6			86	74
95134	141500	28.6173	80.9581	54	307	5.1		
95134	141500	28.6762	80.9987	6			86	73
95134	141500	28.6762	80.9987	54	309	7.0		
95134	141500	28.5231	81.0100	6			86	72
95134	141500	28.5231	81.0100	54	287	5.1		
95134	141500	28.6489	81.0693	6			93	74
95134	141500	28.6489	81.0693	54	333	5.1		
95134	141500	28.4417	81.0291	6			87	73
95134	141500	28.4417	81.0291	54	286	5.1		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	141500	28.6256	80.6571	6			85	75
95134	141500	28.6256	80.6571	12	303	4.1		
95134	141500	28.6256	80.6571	54	313	7.0	83	
95134	141500	28.6256	80.6571	162	315	7.0		
95134	141500	28.6256	80.6571	204	315	8.0	82	
95134	141500	28.6256	80.6571	295	317	8.0		
95134	141500	28.6256	80.6571	394	312	8.0		
95134	141500	28.6256	80.6571	492	306	8.0	80	
95134	141500	28.6256	80.6571	6			85	77
95134	141500	28.6256	80.6571	12	312	4.1		
95134	141500	28.6256	80.6571	54	319	7.0	84	
95134	141500	28.6256	80.6571	162	320	8.0		
95134	141500	28.6256	80.6571	204	325	8.0	82	
95134	141500	28.6256	80.6571	295	319	8.0		
95134	141500	28.6256	80.6571	394	324	8.0		
95134	141500	28.6256	80.6571	492	316	8.0	80	
95134	141500	28.3932	80.8211	6			86	74
95134	141500	28.3932	80.8211	54	310	6.0		
95134	141500	28.3382	80.7321	6			89	78
95134	141500	28.3382	80.7321	54	313	4.1		

METEOROLOGICAL TOWER DATA AT 14:40:00 ZULU TIME (T + 55 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	144000	28.4338	80.5734	6			85	
95134	144000	28.4338	80.5734	12	280	2.9		
95134	144000	28.4338	80.5734	54	280	5.1	84	
95134	144000	28.4598	80.5267	6			85	
95134	144000	28.4598	80.5267	12	298	4.1		
95134	144000	28.4598	80.5267	54	290	5.1	84	
95134	144000	28.4466	80.5652	6				
95134	144000	28.7435	80.7005	6			85	78
95134	144000	28.7435	80.7005	54	360	7.0		
95134	144000	28.7975	80.7378	6			84	77
95134	144000	28.7975	80.7378	54	10	4.1		
95134	144000	28.4721	80.5393	6				
95134	144000	28.4721	80.5393	90	294	6.0		
95134	144000	28.5622	80.5785	6				
95134	144000	28.5622	80.5785	54	303	2.9		
95134	144000	28.5836	80.5842	6				
95134	144000	28.5836	80.5842	54	269	4.1		
95134	144000	28.5130	80.5613	6			84	79
95134	144000	28.5130	80.5613	12	317	2.9		
95134	144000	28.5130	80.5613	54	308	4.1	83	
95134	144000	28.5130	80.5613	162	303	5.1		
95134	144000	28.5130	80.5613	204	293	5.1	82	
95134	144000	28.5130	80.5613	6			84	77
95134	144000	28.5130	80.5613	12	311	1.9		
95134	144000	28.5130	80.5613	54	299	4.1	83	
95134	144000	28.5130	80.5613	162	301	5.1		
95134	144000	28.5130	80.5613	204	300	5.1	82	
95134	144000	28.5358	80.5747	6			85	
95134	144000	28.5358	80.5747	12	317	2.9		
95134	144000	28.5358	80.5747	54	319	4.1	83	
95134	144000	28.6141	80.6203	6			85	
95134	144000	28.6141	80.6203	12	335	4.1		
95134	144000	28.6141	80.6203	54	330	6.0	83	
95134	144000	28.4048	80.6519	6			86	75
95134	144000	28.4048	80.6519	54	292	6.0		
95134	144000	28.4600	80.5711	6			84	
95134	144000	28.4600	80.5711	12	301	2.9		
95134	144000	28.4600	80.5711	54	303	5.1	83	
95134	144000	28.6027	80.6414	6			86	
95134	144000	28.6027	80.6414	12	297	2.9		
95134	144000	28.6027	80.6414	54	290	2.9	84	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	144000	28.6105	80.6069	6				77
95134	144000	28.6105	80.6069	60	316	8.0	85	
95134	144000	28.6057	80.6016	6			86	77
95134	144000	28.6057	80.6016	60	317	5.1	84	
95134	144000	28.6294	80.6235	6				75
95134	144000	28.6294	80.6235	60	334	8.9	83	
95134	144000	28.6248	80.6182	6			84	75
95134	144000	28.6248	80.6182	60	336	8.9	83	
95134	144000	28.4586	80.5923	6			84	
95134	144000	28.4586	80.5923	12	313	5.1		
95134	144000	28.4586	80.5923	54	303	6.0	83	
95134	144000	28.6062	80.6739	6			85	
95134	144000	28.6062	80.6739	12	290	1.9		
95134	144000	28.6062	80.6739	54	311	6.0	84	
95134	144000	28.6586	80.6998	6			85	
95134	144000	28.6586	80.6998	12	293	2.9		
95134	144000	28.6586	80.6998	54	303	4.1	85	
95134	144000	28.7055	80.7265	6			86	75
95134	144000	28.7055	80.7265	54	286	2.9		
95134	144000	28.7755	80.8043	6			85	74
95134	144000	28.7755	80.8043	54	289	7.0		
95134	144000	28.5158	80.6400	6			84	
95134	144000	28.5158	80.6400	12	318	4.1		
95134	144000	28.5158	80.6400	54	311	4.1	83	
95134	144000	28.5623	80.6694	6			85	
95134	144000	28.5623	80.6694	12	269	4.1		
95134	144000	28.5623	80.6694	54	281	4.1	83	
95134	144000	28.5986	80.6817	6				
95134	144000	28.5986	80.6817	30	315	6.0		
95134	144000	28.6160	80.6930	6			87	76
95134	144000	28.6160	80.6930	30	313	6.0		
95134	144000	28.6307	80.7027	6				
95134	144000	28.6307	80.7027	30	307	7.0		
95134	144000	28.6431	80.7482	6			85	
95134	144000	28.6431	80.7482	12	326	1.9		
95134	144000	28.6431	80.7482	54	304	4.1	83	
95134	144000	28.4632	80.6702	6			86	
95134	144000	28.4632	80.6702	12	313	1.9		
95134	144000	28.4632	80.6702	54	300	2.9	85	
95134	144000	28.5184	80.6962	6			84	
95134	144000	28.5184	80.6962	12	290	4.1		
95134	144000	28.5184	80.6962	54	292	5.1	83	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	144000	28.7464	80.8707	6			87	73
95134	144000	28.7464	80.8707	54	280	4.1		
95134	144000	28.4079	80.7604	6				
95134	144000	28.4079	80.7604	54				
95134	144000	28.5272	80.7742	6			86	75
95134	144000	28.5272	80.7742	54	309	7.0		
95134	144000	28.6056	80.8248	6				
95134	144000	28.6056	80.8248	54				
95134	144000	28.5697	80.5864	6			86	79
95134	144000	28.5697	80.5864	12	312	4.1		
95134	144000	28.5697	80.5864	54	318	7.0	84	
95134	144000	28.5697	80.5864	162	315	7.0		
95134	144000	28.5697	80.5864	204	312	7.0	83	
95134	144000	28.5697	80.5864	6			86	79
95134	144000	28.5697	80.5864	12	312	2.9		
95134	144000	28.5697	80.5864	54	312	5.1	84	
95134	144000	28.5697	80.5864	162	311	6.0		
95134	144000	28.5697	80.5864	204	309	5.1	83	
95134	144000	28.4843	80.7856	6			88	74
95134	144000	28.4843	80.7856	54	317	5.1		
95134	144000	28.6445	80.9034	6				
95134	144000	28.4114	80.9284	6			88	76
95134	144000	28.4114	80.9284	54	310	5.1		
95134	144000	28.4475	80.8538	6				
95134	144000	28.4960	80.8843	6				
95134	144000	28.4960	80.8843	54				
95134	144000	28.5583	80.9132	6				
95134	144000	28.6173	80.9581	6			87	73
95134	144000	28.6173	80.9581	54	305	5.1		
95134	144000	28.6762	80.9987	6			87	74
95134	144000	28.6762	80.9987	54	322	6.0		
95134	144000	28.5231	81.0100	6			87	72
95134	144000	28.5231	81.0100	54	274	5.1		
95134	144000	28.6489	81.0693	6			93	62
95134	144000	28.6489	81.0693	54	313	7.0		
95134	144000	28.4417	81.0291	6			88	73
95134	144000	28.4417	81.0291	54	297	5.1		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	144000	28.6256	80.6571	6			86	75
95134	144000	28.6256	80.6571	12	319	4.1		
95134	144000	28.6256	80.6571	54	312	5.1	84	
95134	144000	28.6256	80.6571	162	307	7.0		
95134	144000	28.6256	80.6571	204	309	7.0	83	
95134	144000	28.6256	80.6571	295	311	7.0		
95134	144000	28.6256	80.6571	394	313	8.0		
95134	144000	28.6256	80.6571	492	308	8.0	81	
95134	144000	28.6256	80.6571	6			86	78
95134	144000	28.6256	80.6571	12	327	4.1		
95134	144000	28.6256	80.6571	54	319	5.1	85	
95134	144000	28.6256	80.6571	162	313	7.0		
95134	144000	28.6256	80.6571	204	316	7.0	83	
95134	144000	28.6256	80.6571	295	316	7.0		
95134	144000	28.6256	80.6571	394	324	8.0		
95134	144000	28.6256	80.6571	492	321	8.0	81	
95134	144000	28.3932	80.8211	6			87	74
95134	144000	28.3932	80.8211	54	308	6.0		
95134	144000	28.3382	80.7321	6			91	78
95134	144000	28.3382	80.7321	54	302	5.1		

METEOROLOGICAL TOWER DATA AT 14:55:00 ZULU TIME (T + 1 hour and 10 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	145500	28.4338	80.5734	6			86	
95134	145500	28.4338	80.5734	12	307	2.9		
95134	145500	28.4338	80.5734	54	310	5.1	84	
95134	145500	28.4598	80.5267	6			85	
95134	145500	28.4598	80.5267	12	293	4.1		
95134	145500	28.4598	80.5267	54	288	5.1	83	
95134	145500	28.4466	80.5652	6				
95134	145500	28.7435	80.7005	6			84	78
95134	145500	28.7435	80.7005	54	11	6.0		
95134	145500	28.7975	80.7378	6			84	78
95134	145500	28.7975	80.7378	54	33	4.1		
95134	145500	28.4721	80.5393	6				
95134	145500	28.4721	80.5393	90	315	5.1		
95134	145500	28.5622	80.5785	6				
95134	145500	28.5622	80.5785	54	329	4.1		
95134	145500	28.5836	80.5842	6				
95134	145500	28.5836	80.5842	54	356	6.0		
95134	145500	28.5130	80.5613	6			86	79
95134	145500	28.5130	80.5613	12	330	1.9		
95134	145500	28.5130	80.5613	54	342	4.1	85	
95134	145500	28.5130	80.5613	162	339	6.0		
95134	145500	28.5130	80.5613	204	327	7.0	83	
95134	145500	28.5130	80.5613	6			86	77
95134	145500	28.5130	80.5613	12	326	1.9		
95134	145500	28.5130	80.5613	54	333	4.1	85	
95134	145500	28.5130	80.5613	162	333	7.0		
95134	145500	28.5130	80.5613	204	330	6.0	83	
95134	145500	28.5358	80.5747	6			86	
95134	145500	28.5358	80.5747	12	312	2.9		
95134	145500	28.5358	80.5747	54	309	4.1	84	
95134	145500	28.6141	80.6203	6			84	
95134	145500	28.6141	80.6203	12	27	5.1		
95134	145500	28.6141	80.6203	54	13	8.0	83	
95134	145500	28.4048	80.6519	6			86	76
95134	145500	28.4048	80.6519	54	316	7.0		
95134	145500	28.4600	80.5711	6			86	
95134	145500	28.4600	80.5711	12	340	2.9		
95134	145500	28.4600	80.5711	54	331	5.1	84	
95134	145500	28.6027	80.6414	6			86	
95134	145500	28.6027	80.6414	12	303	4.1		
95134	145500	28.6027	80.6414	54	303	5.1	85	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	145500	28.6105	80.6069	6				77
95134	145500	28.6105	80.6069	60	349	8.9	83	
95134	145500	28.6057	80.6016	6			84	77
95134	145500	28.6057	80.6016	60	5	8.0	82	
95134	145500	28.6294	80.6235	6				75
95134	145500	28.6294	80.6235	60	12	8.0	82	
95134	145500	28.6248	80.6182	6			83	76
95134	145500	28.6248	80.6182	60	6	8.9	82	
95134	145500	28.4586	80.5923	6			85	
95134	145500	28.4586	80.5923	12	330	5.1		
95134	145500	28.4586	80.5923	54	316	6.0	83	
95134	145500	28.6062	80.6739	6			86	
95134	145500	28.6062	80.6739	12	282	1.9		
95134	145500	28.6062	80.6739	54	304	5.1	84	
95134	145500	28.6586	80.6998	6			85	
95134	145500	28.6586	80.6998	12	309	2.9		
95134	145500	28.6586	80.6998	54	318	4.1	86	
95134	145500	28.7055	80.7265	6			87	75
95134	145500	28.7055	80.7265	54	310	2.9		
95134	145500	28.7755	80.8043	6				
95134	145500	28.7755	80.8043	54				
95134	145500	28.5158	80.6400	6			85	
95134	145500	28.5158	80.6400	12	320	4.1		
95134	145500	28.5158	80.6400	54	311	4.1	84	
95134	145500	28.5623	80.6694	6			85	
95134	145500	28.5623	80.6694	12	273	2.9		
95134	145500	28.5623	80.6694	54	280	5.1	83	
95134	145500	28.5986	80.6817	6				
95134	145500	28.5986	80.6817	30	311	7.0		
95134	145500	28.6160	80.6930	6			87	76
95134	145500	28.6160	80.6930	30	293	5.1		
95134	145500	28.6307	80.7027	6				
95134	145500	28.6307	80.7027	30	319	6.0		
95134	145500	28.6431	80.7482	6			86	
95134	145500	28.6431	80.7482	12	334	1.9		
95134	145500	28.6431	80.7482	54	312	2.9	84	
95134	145500	28.4632	80.6702	6			86	
95134	145500	28.4632	80.6702	12	313	1.9		
95134	145500	28.4632	80.6702	54	313	2.9	85	
95134	145500	28.5184	80.6962	6			84	
95134	145500	28.5184	80.6962	12	312	4.1		
95134	145500	28.5184	80.6962	54	315	6.0	83	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	145500	28.7464	80.8707	6			87	73
95134	145500	28.7464	80.8707	54	297	5.1		
95134	145500	28.4079	80.7604	6				
95134	145500	28.4079	80.7604	54				
95134	145500	28.5272	80.7742	6			87	75
95134	145500	28.5272	80.7742	54	332	7.0		
95134	145500	28.6056	80.8248	6				
95134	145500	28.6056	80.8248	54				
95134	145500	28.5697	80.5864	6			87	79
95134	145500	28.5697	80.5864	12	323	4.1		
95134	145500	28.5697	80.5864	54	339	6.0	85	
95134	145500	28.5697	80.5864	162	335	7.0		
95134	145500	28.5697	80.5864	204	332	7.0	83	
95134	145500	28.5697	80.5864	6			87	79
95134	145500	28.5697	80.5864	12	323	2.9		
95134	145500	28.5697	80.5864	54	333	6.0	84	
95134	145500	28.5697	80.5864	162	333	7.0		
95134	145500	28.5697	80.5864	204	333	6.0	83	
95134	145500	28.4843	80.7856	6			89	74
95134	145500	28.4843	80.7856	54	294	6.0		
95134	145500	28.6445	80.9034	6				
95134	145500	28.4114	80.9284	6			89	76
95134	145500	28.4114	80.9284	54	312	6.0		
95134	145500	28.4475	80.8538	6				
95134	145500	28.4960	80.8843	6				
95134	145500	28.4960	80.8843	54				
95134	145500	28.5583	80.9132	6				
95134	145500	28.6173	80.9581	6				
95134	145500	28.6173	80.9581	54				
95134	145500	28.6762	80.9987	6			89	74
95134	145500	28.6762	80.9987	54	291	6.0		
95134	145500	28.5231	81.0100	6			87	72
95134	145500	28.5231	81.0100	54	308	5.1		
95134	145500	28.6489	81.0693	6			91	61
95134	145500	28.6489	81.0693	54	304	7.0		
95134	145500	28.4417	81.0291	6			89	73
95134	145500	28.4417	81.0291	54	271	6.0		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	145500	28.6256	80.6571	6			86	75
95134	145500	28.6256	80.6571	12	318	4.1		
95134	145500	28.6256	80.6571	54	324	8.0	85	
95134	145500	28.6256	80.6571	162	317	8.9		
95134	145500	28.6256	80.6571	204	317	8.9	83	
95134	145500	28.6256	80.6571	295	320	8.9		
95134	145500	28.6256	80.6571	394	317	8.9		
95134	145500	28.6256	80.6571	492	314	8.9	81	
95134	145500	28.6256	80.6571	6			87	77
95134	145500	28.6256	80.6571	12	326	4.1		
95134	145500	28.6256	80.6571	54	328	7.0	85	
95134	145500	28.6256	80.6571	162	323	8.9		
95134	145500	28.6256	80.6571	204	327	8.9	83	
95134	145500	28.6256	80.6571	295	324	8.9		
95134	145500	28.6256	80.6571	394	328	8.9		
95134	145500	28.6256	80.6571	492	324	8.9	81	
95134	145500	28.3932	80.8211	6			88	74
95134	145500	28.3932	80.8211	54	292	5.1		
95134	145500	28.3382	80.7321	6			92	78
95134	145500	28.3382	80.7321	54	298	4.1		

METEOROLOGICAL TOWER DATA AT 15:10:00 ZULU TIME (T + 1 hour and 25 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	151000	28.4338	80.5734	6			86	
95134	151000	28.4338	80.5734	12	287	2.9		
95134	151000	28.4338	80.5734	54	300	5.1	85	
95134	151000	28.4598	80.5267	6			86	
95134	151000	28.4598	80.5267	12	304	5.1		
95134	151000	28.4598	80.5267	54	294	6.0	84	
95134	151000	28.4466	80.5652	6				
95134	151000	28.7435	80.7005	6			83	78
95134	151000	28.7435	80.7005	54	29	6.0		
95134	151000	28.7975	80.7378	6			86	78
95134	151000	28.7975	80.7378	54	47	5.1		
95134	151000	28.4721	80.5393	6				
95134	151000	28.4721	80.5393	90	320	7.0		
95134	151000	28.5622	80.5785	6				
95134	151000	28.5622	80.5785	54	7	6.0		
95134	151000	28.5836	80.5842	6				
95134	151000	28.5836	80.5842	54	3	6.0		
95134	151000	28.5130	80.5613	6			86	80
95134	151000	28.5130	80.5613	12	44	2.9		
95134	151000	28.5130	80.5613	54	27	5.1	84	
95134	151000	28.5130	80.5613	162	25	6.0		
95134	151000	28.5130	80.5613	204	25	7.0	82	
95134	151000	28.5130	80.5613	6			85	77
95134	151000	28.5130	80.5613	12	38	4.1		
95134	151000	28.5130	80.5613	54	18	5.1	84	
95134	151000	28.5130	80.5613	162	18	6.0		
95134	151000	28.5130	80.5613	204	15	7.0	82	
95134	151000	28.5358	80.5747	6			86	
95134	151000	28.5358	80.5747	12	310	2.9		
95134	151000	28.5358	80.5747	54	309	2.9	84	
95134	151000	28.6141	80.6203	6			84	
95134	151000	28.6141	80.6203	12	29	5.1		
95134	151000	28.6141	80.6203	54	13	8.0	82	
95134	151000	28.4048	80.6519	6			87	76
95134	151000	28.4048	80.6519	54	319	7.0		
95134	151000	28.4600	80.5711	6			86	
95134	151000	28.4600	80.5711	12	346	2.9		
95134	151000	28.4600	80.5711	54	331	6.0	84	
95134	151000	28.6027	80.6414	6			86	
95134	151000	28.6027	80.6414	12	300	2.9		
95134	151000	28.6027	80.6414	54	298	4.1	85	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	151000	28.6105	80.6069	6				76
95134	151000	28.6105	80.6069	60	355	8.0	83	
95134	151000	28.6057	80.6016	6			83	76
95134	151000	28.6057	80.6016	60	11	8.0	82	
95134	151000	28.6294	80.6235	6				75
95134	151000	28.6294	80.6235	60	16	8.0	82	
95134	151000	28.6248	80.6182	6			83	75
95134	151000	28.6248	80.6182	60	12	8.9	82	
95134	151000	28.4586	80.5923	6			85	
95134	151000	28.4586	80.5923	12	316	4.1		
95134	151000	28.4586	80.5923	54	306	5.1	84	
95134	151000	28.6062	80.6739	6			87	
95134	151000	28.6062	80.6739	12	331	1.0		
95134	151000	28.6062	80.6739	54	330	4.1	85	
95134	151000	28.6586	80.6998	6			86	
95134	151000	28.6586	80.6998	12	337	4.1		
95134	151000	28.6586	80.6998	54	338	5.1	87	
95134	151000	28.7055	80.7265	6			86	76
95134	151000	28.7055	80.7265	54	13	1.0		
95134	151000	28.7755	80.8043	6			87	75
95134	151000	28.7755	80.8043	54	289	6.0		
95134	151000	28.5158	80.6400	6			86	
95134	151000	28.5158	80.6400	12	308	4.1		
95134	151000	28.5158	80.6400	54	307	5.1	84	
95134	151000	28.5623	80.6694	6			86	
95134	151000	28.5623	80.6694	12	265	2.9		
95134	151000	28.5623	80.6694	54	266	4.1	84	
95134	151000	28.5986	80.6817	6				
95134	151000	28.5986	80.6817	30	319	5.1		
95134	151000	28.6160	80.6930	6			88	75
95134	151000	28.6160	80.6930	30	301	5.1		
95134	151000	28.6307	80.7027	6				
95134	151000	28.6307	80.7027	30	302	6.0		
95134	151000	28.6431	80.7482	6			87	
95134	151000	28.6431	80.7482	12	324	1.9		
95134	151000	28.6431	80.7482	54	312	4.1	84	
95134	151000	28.4632	80.6702	6			87	
95134	151000	28.4632	80.6702	12	340	1.9		
95134	151000	28.4632	80.6702	54	319	2.9	85	
95134	151000	28.5184	80.6962	6			85	
95134	151000	28.5184	80.6962	12	288	2.9		
95134	151000	28.5184	80.6962	54	290	4.1	84	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	151000	28.7464	80.8707	6			88	74
95134	151000	28.7464	80.8707	54	299	6.0		
95134	151000	28.4079	80.7604	6				
95134	151000	28.4079	80.7604	54				
95134	151000	28.5272	80.7742	6			87	74
95134	151000	28.5272	80.7742	54	332	2.9		
95134	151000	28.6056	80.8248	6				
95134	151000	28.6056	80.8248	54				
95134	151000	28.5697	80.5864	6			87	80
95134	151000	28.5697	80.5864	12	7	1.9		
95134	151000	28.5697	80.5864	54	11	8.0	84	
95134	151000	28.5697	80.5864	162	4	8.0		
95134	151000	28.5697	80.5864	204	1	8.0	83	
95134	151000	28.5697	80.5864	6			87	81
95134	151000	28.5697	80.5864	12	9	2.9		
95134	151000	28.5697	80.5864	54	8	7.0	84	
95134	151000	28.5697	80.5864	162	1	8.0		
95134	151000	28.5697	80.5864	204	359	8.0	82	
95134	151000	28.4843	80.7856	6			90	75
95134	151000	28.4843	80.7856	54	324	1.0		
95134	151000	28.6445	80.9034	6				
95134	151000	28.4114	80.9284	6			89	76
95134	151000	28.4114	80.9284	54	293	4.1		
95134	151000	28.4475	80.8538	6				
95134	151000	28.4960	80.8843	6				
95134	151000	28.4960	80.8843	54				
95134	151000	28.5583	80.9132	6				
95134	151000	28.6173	80.9581	6			88	74
95134	151000	28.6173	80.9581	54	274	5.1		
95134	151000	28.6762	80.9987	6			90	72
95134	151000	28.6762	80.9987	54	288	8.9		
95134	151000	28.5231	81.0100	6				
95134	151000	28.5231	81.0100	54				
95134	151000	28.6489	81.0693	6			84	28
95134	151000	28.6489	81.0693	54	301	8.0		
95134	151000	28.4417	81.0291	6			89	73
95134	151000	28.4417	81.0291	54	298	6.0		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	151000	28.6256	80.6571	6			86	76
95134	151000	28.6256	80.6571	12	357	5.1		
95134	151000	28.6256	80.6571	54	358	6.0	84	
95134	151000	28.6256	80.6571	162	351	6.0		
95134	151000	28.6256	80.6571	204	352	6.0	84	
95134	151000	28.6256	80.6571	295	349	6.0		
95134	151000	28.6256	80.6571	394	343	6.0		
95134	151000	28.6256	80.6571	492	334	6.0	81	
95134	151000	28.6256	80.6571	6			86	78
95134	151000	28.6256	80.6571	12	4	5.1		
95134	151000	28.6256	80.6571	54	359	6.0	85	
95134	151000	28.6256	80.6571	162	355	7.0		
95134	151000	28.6256	80.6571	204	359	6.0	83	
95134	151000	28.6256	80.6571	295	352	6.0		
95134	151000	28.6256	80.6571	394	352	6.0		
95134	151000	28.6256	80.6571	492	344	6.0	81	
95134	151000	28.3932	80.8211	6			88	73
95134	151000	28.3932	80.8211	54	261	7.0		
95134	151000	28.3382	80.7321	6			92	78
95134	151000	28.3382	80.7321	54	305	6.0		

METEOROLOGICAL TOWER DATA AT 15:30:00 ZULU TIME (T + 1 hour and 45 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	153000	28.4338	80.5734	6			87	
95134	153000	28.4338	80.5734	12	286	1.9		
95134	153000	28.4338	80.5734	54	298	4.1	86	
95134	153000	28.4598	80.5267	6			83	
95134	153000	28.4598	80.5267	12	25	7.0		
95134	153000	28.4598	80.5267	54	21	8.0	80	
95134	153000	28.4466	80.5652	6				
95134	153000	28.7435	80.7005	6			84	78
95134	153000	28.7435	80.7005	54	43	7.0		
95134	153000	28.7975	80.7378	6			87	78
95134	153000	28.7975	80.7378	54	56	5.1		
95134	153000	28.4721	80.5393	6				
95134	153000	28.4721	80.5393	90	25	7.0		
95134	153000	28.5622	80.5785	6				
95134	153000	28.5622	80.5785	54	20	6.0		
95134	153000	28.5836	80.5842	6				
95134	153000	28.5836	80.5842	54	9	6.0		
95134	153000	28.5130	80.5613	6			84	79
95134	153000	28.5130	80.5613	12	35	5.1		
95134	153000	28.5130	80.5613	54	24	8.0	83	
95134	153000	28.5130	80.5613	162	22	8.9		
95134	153000	28.5130	80.5613	204	21	9.9	81	
95134	153000	28.5130	80.5613	6			84	77
95134	153000	28.5130	80.5613	12	30	5.1		
95134	153000	28.5130	80.5613	54	15	7.0	83	
95134	153000	28.5130	80.5613	162	14	8.9		
95134	153000	28.5130	80.5613	204	11	8.9	81	
95134	153000	28.5358	80.5747	6			86	
95134	153000	28.5358	80.5747	12	9	2.9		
95134	153000	28.5358	80.5747	54	9	6.0	84	
95134	153000	28.6141	80.6203	6			84	
95134	153000	28.6141	80.6203	12	37	6.0		
95134	153000	28.6141	80.6203	54	17	7.0	82	
95134	153000	28.4048	80.6519	6			89	75
95134	153000	28.4048	80.6519	54	316	6.0		
95134	153000	28.4600	80.5711	6			86	
95134	153000	28.4600	80.5711	12	322	1.9		
95134	153000	28.4600	80.5711	54	323	5.1	85	
95134	153000	28.6027	80.6414	6			86	
95134	153000	28.6027	80.6414	12	340	2.9		
95134	153000	28.6027	80.6414	54	345	4.1	85	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	153000	28.6105	80.6069	6				76
95134	153000	28.6105	80.6069	60	1	8.0	83	
95134	153000	28.6057	80.6016	6			84	76
95134	153000	28.6057	80.6016	60	15	8.0	82	
95134	153000	28.6294	80.6235	6				75
95134	153000	28.6294	80.6235	60	25	8.0	82	
95134	153000	28.6248	80.6182	6			84	75
95134	153000	28.6248	80.6182	60	13	8.0	83	
95134	153000	28.4586	80.5923	6			87	
95134	153000	28.4586	80.5923	12	322	4.1		
95134	153000	28.4586	80.5923	54	316	5.1	85	
95134	153000	28.6062	80.6739	6			87	
95134	153000	28.6062	80.6739	12	303	1.9		
95134	153000	28.6062	80.6739	54	313	5.1	85	
95134	153000	28.6586	80.6998	6			87	
95134	153000	28.6586	80.6998	12	313	2.9		
95134	153000	28.6586	80.6998	54	315	4.1	88	
95134	153000	28.7055	80.7265	6			87	77
95134	153000	28.7055	80.7265	54	37	1.9		
95134	153000	28.7755	80.8043	6			87	75
95134	153000	28.7755	80.8043	54	272	5.1		
95134	153000	28.5158	80.6400	6			86	
95134	153000	28.5158	80.6400	12	286	2.9		
95134	153000	28.5158	80.6400	54	291	5.1	85	
95134	153000	28.5623	80.6694	6			87	
95134	153000	28.5623	80.6694	12	277	2.9		
95134	153000	28.5623	80.6694	54	279	4.1	85	
95134	153000	28.5986	80.6817	6				
95134	153000	28.5986	80.6817	30	316	5.1		
95134	153000	28.6160	80.6930	6			90	75
95134	153000	28.6160	80.6930	30	331	5.1		
95134	153000	28.6307	80.7027	6				
95134	153000	28.6307	80.7027	30	285	5.1		
95134	153000	28.6431	80.7482	6			88	
95134	153000	28.6431	80.7482	12	296	1.9		
95134	153000	28.6431	80.7482	54	282	4.1	85	
95134	153000	28.4632	80.6702	6			87	
95134	153000	28.4632	80.6702	12	319	2.9		
95134	153000	28.4632	80.6702	54	312	4.1	86	
95134	153000	28.5184	80.6962	6			85	
95134	153000	28.5184	80.6962	12	344	1.9		
95134	153000	28.5184	80.6962	54	350	2.9	84	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	153000	28.7464	80.8707	6			88	74
95134	153000	28.7464	80.8707	54	260	5.1		
95134	153000	28.4079	80.7604	6				
95134	153000	28.4079	80.7604	54				
95134	153000	28.5272	80.7742	6			88	78
95134	153000	28.5272	80.7742	54	23	6.0		
95134	153000	28.6056	80.8248	6				
95134	153000	28.6056	80.8248	54				
95134	153000	28.5697	80.5864	6			86	79
95134	153000	28.5697	80.5864	12	12	2.9		
95134	153000	28.5697	80.5864	54	13	8.0	84	
95134	153000	28.5697	80.5864	162	15	8.9		
95134	153000	28.5697	80.5864	204	13	8.9	83	
95134	153000	28.5697	80.5864	6			86	80
95134	153000	28.5697	80.5864	12	13	2.9		
95134	153000	28.5697	80.5864	54	9	8.0	83	
95134	153000	28.5697	80.5864	162	12	8.9		
95134	153000	28.5697	80.5864	204	12	8.9	82	
95134	153000	28.4843	80.7856	6			91	74
95134	153000	28.4843	80.7856	54	290	5.1		
95134	153000	28.6445	80.9034	6				
95134	153000	28.4114	80.9284	6			89	75
95134	153000	28.4114	80.9284	54	310	4.1		
95134	153000	28.4475	80.8538	6				
95134	153000	28.4960	80.8843	6				
95134	153000	28.4960	80.8843	54				
95134	153000	28.5583	80.9132	6				
95134	153000	28.6173	80.9581	6			89	73
95134	153000	28.6173	80.9581	54	287	6.0		
95134	153000	28.6762	80.9987	6			90	73
95134	153000	28.6762	80.9987	54	285	7.0		
95134	153000	28.5231	81.0100	6			88	72
95134	153000	28.5231	81.0100	54	260	7.0		
95134	153000	28.6489	81.0693	6			91	
95134	153000	28.6489	81.0693	54	287	5.1		
95134	153000	28.4417	81.0291	6			90	72
95134	153000	28.4417	81.0291	54	292	6.0		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	153000	28.6256	80.6571	6			86	76
95134	153000	28.6256	80.6571	12	11	2.9		
95134	153000	28.6256	80.6571	54	20	4.1	85	
95134	153000	28.6256	80.6571	162	9	5.1		
95134	153000	28.6256	80.6571	204	4	5.1	83	
95134	153000	28.6256	80.6571	295	357	6.0		
95134	153000	28.6256	80.6571	394	350	6.0		
95134	153000	28.6256	80.6571	492	342	7.0	82	
95134	153000	28.6256	80.6571	6			87	78
95134	153000	28.6256	80.6571	12	13	2.9		
95134	153000	28.6256	80.6571	54	17	4.1	85	
95134	153000	28.6256	80.6571	162	11	5.1		
95134	153000	28.6256	80.6571	204	8	5.1	83	
95134	153000	28.6256	80.6571	295	359	6.0		
95134	153000	28.6256	80.6571	394	359	6.0		
95134	153000	28.6256	80.6571	492	351	7.0	81	
95134	153000	28.3932	80.8211	6			89	73
95134	153000	28.3932	80.8211	54	287	7.0		
95134	153000	28.3382	80.7321	6			93	77
95134	153000	28.3382	80.7321	54	270	5.1		

METEOROLOGICAL TOWER DATA AT 16:00:00 ZULU TIME (T + 2 hours and 15 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	160000	28.4338	80.5734	6			89	
95134	160000	28.4338	80.5734	12	0	1.9		
95134	160000	28.4338	80.5734	54	345	2.9	87	
95134	160000	28.4598	80.5267	6			83	
95134	160000	28.4598	80.5267	12	34	6.0		
95134	160000	28.4598	80.5267	54	28	8.9	79	
95134	160000	28.4466	80.5652	6				
95134	160000	28.7435	80.7005	6			87	79
95134	160000	28.7435	80.7005	54	64	6.0		
95134	160000	28.7975	80.7378	6			87	78
95134	160000	28.7975	80.7378	54	62	8.0		
95134	160000	28.4721	80.5393	6				
95134	160000	28.4721	80.5393	90	27	6.0		
95134	160000	28.5622	80.5785	6				
95134	160000	28.5622	80.5785	54	30	6.0		
95134	160000	28.5836	80.5842	6				
95134	160000	28.5836	80.5842	54	23	6.0		
95134	160000	28.5130	80.5613	6			84	79
95134	160000	28.5130	80.5613	12	46	4.1		
95134	160000	28.5130	80.5613	54	37	6.0	83	
95134	160000	28.5130	80.5613	162	35	8.0		
95134	160000	28.5130	80.5613	204	34	8.9	81	
95134	160000	28.5130	80.5613	6			84	77
95134	160000	28.5130	80.5613	12	41	5.1		
95134	160000	28.5130	80.5613	54	31	6.0	83	
95134	160000	28.5130	80.5613	162	28	8.0		
95134	160000	28.5130	80.5613	204	24	8.9	80	
95134	160000	28.5358	80.5747	6			85	
95134	160000	28.5358	80.5747	12	40	2.9		
95134	160000	28.5358	80.5747	54	35	6.0	83	
95134	160000	28.6141	80.6203	6			84	
95134	160000	28.6141	80.6203	12	38	6.0		
95134	160000	28.6141	80.6203	54	28	8.0	82	
95134	160000	28.4048	80.6519	6			90	74
95134	160000	28.4048	80.6519	54	317	1.9		
95134	160000	28.4600	80.5711	6			88	
95134	160000	28.4600	80.5711	12	336	1.9		
95134	160000	28.4600	80.5711	54	331	1.9	86	
95134	160000	28.6027	80.6414	6			85	
95134	160000	28.6027	80.6414	12	31	1.0		
95134	160000	28.6027	80.6414	54	26	1.9	85	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	160000	28.6105	80.6069	6				77
95134	160000	28.6105	80.6069	60	19	8.0	83	
95134	160000	28.6057	80.6016	6			84	76
95134	160000	28.6057	80.6016	60	29	8.0	83	
95134	160000	28.6294	80.6235	6				75
95134	160000	28.6294	80.6235	60	33	7.0	83	
95134	160000	28.6248	80.6182	6			84	75
95134	160000	28.6248	80.6182	60	31	7.0	83	
95134	160000	28.4586	80.5923	6			87	
95134	160000	28.4586	80.5923	12	352	4.1		
95134	160000	28.4586	80.5923	54	347	4.1	85	
95134	160000	28.6062	80.6739	6			87	
95134	160000	28.6062	80.6739	12	327	1.0		
95134	160000	28.6062	80.6739	54	317	1.9	86	
95134	160000	28.6586	80.6998	6			88	
95134	160000	28.6586	80.6998	12	44	2.9		
95134	160000	28.6586	80.6998	54	43	5.1	88	
95134	160000	28.7055	80.7265	6			86	76
95134	160000	28.7055	80.7265	54	55	2.9		
95134	160000	28.7755	80.8043	6			93	76
95134	160000	28.7755	80.8043	54	256	2.9		
95134	160000	28.5158	80.6400	6			87	
95134	160000	28.5158	80.6400	12	264	2.9		
95134	160000	28.5158	80.6400	54	267	5.1	86	
95134	160000	28.5623	80.6694	6			88	
95134	160000	28.5623	80.6694	12	287	2.9		
95134	160000	28.5623	80.6694	54	287	5.1	86	
95134	160000	28.5986	80.6817	6				
95134	160000	28.5986	80.6817	30	297	4.1		
95134	160000	28.6160	80.6930	6			89	73
95134	160000	28.6160	80.6930	30	258	5.1		
95134	160000	28.6307	80.7027	6				
95134	160000	28.6307	80.7027	30	304	5.1		
95134	160000	28.6431	80.7482	6			89	
95134	160000	28.6431	80.7482	12	297	1.9		
95134	160000	28.6431	80.7482	54	289	4.1	86	
95134	160000	28.4632	80.6702	6			89	
95134	160000	28.4632	80.6702	12	352	1.9		
95134	160000	28.4632	80.6702	54	329	4.1	87	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	160000	28.5184	80.6962	6			87	
95134	160000	28.5184	80.6962	12	6	1.9		
95134	160000	28.5184	80.6962	54	7	2.9	87	
95134	160000	28.7464	80.8707	6			89	73
95134	160000	28.7464	80.8707	54	267	4.1		
95134	160000	28.4079	80.7604	6				
95134	160000	28.4079	80.7604	54				
95134	160000	28.5272	80.7742	6			87	77
95134	160000	28.5272	80.7742	54	41	6.0		
95134	160000	28.6056	80.8248	6				
95134	160000	28.6056	80.8248	54				
95134	160000	28.5697	80.5864	6			86	79
95134	160000	28.5697	80.5864	12	39	2.9		
95134	160000	28.5697	80.5864	54	30	7.0	84	
95134	160000	28.5697	80.5864	162	22	8.0		
95134	160000	28.5697	80.5864	204	19	8.0	83	
95134	160000	28.5697	80.5864	6			86	79
95134	160000	28.5697	80.5864	12	39	4.1		
95134	160000	28.5697	80.5864	54	26	7.0	84	
95134	160000	28.5697	80.5864	162	20	8.0		
95134	160000	28.5697	80.5864	204	18	8.0	82	
95134	160000	28.4843	80.7856	6			92	75
95134	160000	28.4843	80.7856	54	268	5.1		
95134	160000	28.6445	80.9034	6				
95134	160000	28.4114	80.9284	6			90	76
95134	160000	28.4114	80.9284	54	271	6.0		
95134	160000	28.4475	80.8538	6				
95134	160000	28.4960	80.8843	6				
95134	160000	28.4960	80.8843	54				
95134	160000	28.5583	80.9132	6				
95134	160000	28.6173	80.9581	6				
95134	160000	28.6173	80.9581	54				
95134	160000	28.6762	80.9987	6			91	73
95134	160000	28.6762	80.9987	54	269	7.0		
95134	160000	28.5231	81.0100	6			89	71
95134	160000	28.5231	81.0100	54	272	7.0		
95134	160000	28.6489	81.0693	6			94	63
95134	160000	28.6489	81.0693	54	270	4.1		
95134	160000	28.4417	81.0291	6			91	72
95134	160000	28.4417	81.0291	54	288	5.1		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	160000	28.6256	80.6571	6			88	76
95134	160000	28.6256	80.6571	12	7	4.1		
95134	160000	28.6256	80.6571	54	15	5.1	86	
95134	160000	28.6256	80.6571	162	17	5.1		
95134	160000	28.6256	80.6571	204	15	5.1	85	
95134	160000	28.6256	80.6571	295	17	5.1		
95134	160000	28.6256	80.6571	394	11	5.1		
95134	160000	28.6256	80.6571	492	4	5.1	83	
95134	160000	28.6256	80.6571	6			88	78
95134	160000	28.6256	80.6571	12	9	4.1		
95134	160000	28.6256	80.6571	54	14	5.1	86	
95134	160000	28.6256	80.6571	162	16	5.1		
95134	160000	28.6256	80.6571	204	17	5.1	85	
95134	160000	28.6256	80.6571	295	14	4.1		
95134	160000	28.6256	80.6571	394	13	4.1		
95134	160000	28.6256	80.6571	492	3	4.1	83	
95134	160000	28.3932	80.8211	6				
95134	160000	28.3932	80.8211	54				
95134	160000	28.3382	80.7321	6			94	77
95134	160000	28.3382	80.7321	54	298	4.1		

METEOROLOGICAL TOWER DATA AT 16:30:00 ZULU TIME (T + 2 hours and 45 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	163000	28.4338	80.5734	6			89	
95134	163000	28.4338	80.5734	12	16	2.9		
95134	163000	28.4338	80.5734	54	21	4.1	87	
95134	163000	28.4598	80.5267	6			83	
95134	163000	28.4598	80.5267	12	35	6.0		
95134	163000	28.4598	80.5267	54	30	8.9	79	
95134	163000	28.4466	80.5652	6				
95134	163000	28.7435	80.7005	6			87	79
95134	163000	28.7435	80.7005	54	77	7.0		
95134	163000	28.7975	80.7378	6			85	77
95134	163000	28.7975	80.7378	54	104	6.0		
95134	163000	28.4721	80.5393	6				
95134	163000	28.4721	80.5393	90	29	7.0		
95134	163000	28.5622	80.5785	6				
95134	163000	28.5622	80.5785	54	42	4.1		
95134	163000	28.5836	80.5842	6				
95134	163000	28.5836	80.5842	54	31	5.1		
95134	163000	28.5130	80.5613	6			84	79
95134	163000	28.5130	80.5613	12	51	5.1		
95134	163000	28.5130	80.5613	54	44	7.0	83	
95134	163000	28.5130	80.5613	162	40	8.0		
95134	163000	28.5130	80.5613	204	38	8.9	81	
95134	163000	28.5130	80.5613	6			84	77
95134	163000	28.5130	80.5613	12	44	5.1		
95134	163000	28.5130	80.5613	54	36	7.0	82	
95134	163000	28.5130	80.5613	162	33	8.0		
95134	163000	28.5130	80.5613	204	30	8.9	81	
95134	163000	28.5358	80.5747	6			86	
95134	163000	28.5358	80.5747	12	35	2.9		
95134	163000	28.5358	80.5747	54	34	5.1	84	
95134	163000	28.6141	80.6203	6			85	
95134	163000	28.6141	80.6203	12	46	5.1		
95134	163000	28.6141	80.6203	54	36	6.0	83	
95134	163000	28.4048	80.6519	6			89	76
95134	163000	28.4048	80.6519	54	57	4.1		
95134	163000	28.4600	80.5711	6			89	
95134	163000	28.4600	80.5711	12	357	1.9		
95134	163000	28.4600	80.5711	54	329	2.9	87	
95134	163000	28.6027	80.6414	6			87	
95134	163000	28.6027	80.6414	12	36	4.1		
95134	163000	28.6027	80.6414	54	35	6.0	85	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	163000	28.6105	80.6069	6				76
95134	163000	28.6105	80.6069	60	23	8.0	84	
95134	163000	28.6057	80.6016	6			85	77
95134	163000	28.6057	80.6016	60	40	8.0	83	
95134	163000	28.6294	80.6235	6				75
95134	163000	28.6294	80.6235	60	42	8.0	83	
95134	163000	28.6248	80.6182	6			84	75
95134	163000	28.6248	80.6182	60	46	8.0	83	
95134	163000	28.4586	80.5923	6			89	
95134	163000	28.4586	80.5923	12	352	5.1		
95134	163000	28.4586	80.5923	54	341	6.0	86	
95134	163000	28.6062	80.6739	6			89	
95134	163000	28.6062	80.6739	12	282	1.0		
95134	163000	28.6062	80.6739	54	302	1.9	87	
95134	163000	28.6586	80.6998	6			88	
95134	163000	28.6586	80.6998	12	46	2.9		
95134	163000	28.6586	80.6998	54	38	5.1	87	
95134	163000	28.7055	80.7265	6			86	77
95134	163000	28.7055	80.7265	54	64	4.1		
95134	163000	28.7755	80.8043	6			89	77
95134	163000	28.7755	80.8043	54	92	4.1		
95134	163000	28.5158	80.6400	6			87	
95134	163000	28.5158	80.6400	12	121	1.0		
95134	163000	28.5158	80.6400	54	125	2.9	85	
95134	163000	28.5623	80.6694	6			90	
95134	163000	28.5623	80.6694	12	314	1.0		
95134	163000	28.5623	80.6694	54	328	2.9	87	
95134	163000	28.5986	80.6817	6				
95134	163000	28.5986	80.6817	30	342	4.1		
95134	163000	28.6160	80.6930	6			92	73
95134	163000	28.6160	80.6930	30	318	4.1		
95134	163000	28.6307	80.7027	6				
95134	163000	28.6307	80.7027	30	250	5.1		
95134	163000	28.6431	80.7482	6			90	
95134	163000	28.6431	80.7482	12	300	1.0		
95134	163000	28.6431	80.7482	54	295	2.9	87	
95134	163000	28.4632	80.6702	6			89	
95134	163000	28.4632	80.6702	12	353	2.9		
95134	163000	28.4632	80.6702	54	325	4.1	87	
95134	163000	28.5184	80.6962	6			88	
95134	163000	28.5184	80.6962	12	317	1.9		
95134	163000	28.5184	80.6962	54	332	2.9	87	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	163000	28.7464	80.8707	6			90	72
95134	163000	28.7464	80.8707	54	274	5.1		
95134	163000	28.4079	80.7604	6				
95134	163000	28.4079	80.7604	54				
95134	163000	28.5272	80.7742	6			88	77
95134	163000	28.5272	80.7742	54	46	6.0		
95134	163000	28.6056	80.8248	6				
95134	163000	28.6056	80.8248	54				
95134	163000	28.5697	80.5864	6			87	78
95134	163000	28.5697	80.5864	12	29	2.9		
95134	163000	28.5697	80.5864	54	30	7.0	84	
95134	163000	28.5697	80.5864	162	32	7.0		
95134	163000	28.5697	80.5864	204	31	7.0	83	
95134	163000	28.5697	80.5864	6			87	78
95134	163000	28.5697	80.5864	12	29	2.9		
95134	163000	28.5697	80.5864	54	26	6.0	84	
95134	163000	28.5697	80.5864	162	28	7.0		
95134	163000	28.5697	80.5864	204	30	7.0	83	
95134	163000	28.4843	80.7856	6			92	75
95134	163000	28.4843	80.7856	54	357	1.9		
95134	163000	28.6445	80.9034	6				
95134	163000	28.4114	80.9284	6			91	75
95134	163000	28.4114	80.9284	54	256	2.9		
95134	163000	28.4475	80.8538	6				
95134	163000	28.4960	80.8843	6				
95134	163000	28.4960	80.8843	54				
95134	163000	28.5583	80.9132	6				
95134	163000	28.6173	80.9581	6			90	73
95134	163000	28.6173	80.9581	54	302	7.0		
95134	163000	28.6762	80.9987	6				
95134	163000	28.6762	80.9987	54				
95134	163000	28.5231	81.0100	6			90	71
95134	163000	28.5231	81.0100	54	282	5.1		
95134	163000	28.6489	81.0693	6				
95134	163000	28.6489	81.0693	54				
95134	163000	28.4417	81.0291	6			92	72
95134	163000	28.4417	81.0291	54	267	7.0		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	163000	28.6256	80.6571	6			88	75
95134	163000	28.6256	80.6571	12	36	4.1		
95134	163000	28.6256	80.6571	54	43	6.0	86	
95134	163000	28.6256	80.6571	162	38	8.0		
95134	163000	28.6256	80.6571	204	37	8.0	85	
95134	163000	28.6256	80.6571	295	33	7.0		
95134	163000	28.6256	80.6571	394	23	7.0		
95134	163000	28.6256	80.6571	492	7	7.0	83	
95134	163000	28.6256	80.6571	6			89	78
95134	163000	28.6256	80.6571	12	35	4.1		
95134	163000	28.6256	80.6571	54	40	5.1	87	
95134	163000	28.6256	80.6571	162	36	5.1		
95134	163000	28.6256	80.6571	204	39	5.1	85	
95134	163000	28.6256	80.6571	295	32	5.1		
95134	163000	28.6256	80.6571	394	27	5.1		
95134	163000	28.6256	80.6571	492	12	7.0	83	
95134	163000	28.3932	80.8211	6			91	73
95134	163000	28.3932	80.8211	54	292	4.1		
95134	163000	28.3382	80.7321	6			90	75
95134	163000	28.3382	80.7321	54	333	2.9		

METEOROLOGICAL TOWER DATA AT 17:00:00 ZULU TIME (T + 3 hours and 15 minutes)

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	170000	28.4338	80.5734	6			89	
95134	170000	28.4338	80.5734	12	53	1.9		
95134	170000	28.4338	80.5734	54	53	7.0	86	
95134	170000	28.4598	80.5267	6			82	
95134	170000	28.4598	80.5267	12	48	6.0		
95134	170000	28.4598	80.5267	54	44	8.9	80	
95134	170000	28.4466	80.5652	6				
95134	170000	28.7435	80.7005	6			87	78
95134	170000	28.7435	80.7005	54	62	8.9		
95134	170000	28.7975	80.7378	6			86	78
95134	170000	28.7975	80.7378	54	83	7.0		
95134	170000	28.4721	80.5393	6				
95134	170000	28.4721	80.5393	90	45	8.9		
95134	170000	28.5622	80.5785	6				
95134	170000	28.5622	80.5785	54	59	5.1		
95134	170000	28.5836	80.5842	6				
95134	170000	28.5836	80.5842	54	39	7.0		
95134	170000	28.5130	80.5613	6			85	79
95134	170000	28.5130	80.5613	12	56	5.1		
95134	170000	28.5130	80.5613	54	52	6.0	83	
95134	170000	28.5130	80.5613	162	52	8.0		
95134	170000	28.5130	80.5613	204	52	9.9	81	
95134	170000	28.5130	80.5613	6			84	77
95134	170000	28.5130	80.5613	12	53	4.1		
95134	170000	28.5130	80.5613	54	44	6.0	83	
95134	170000	28.5130	80.5613	162	45	8.0		
95134	170000	28.5130	80.5613	204	44	8.9	81	
95134	170000	28.5358	80.5747	6			85	
95134	170000	28.5358	80.5747	12	43	5.1		
95134	170000	28.5358	80.5747	54	40	8.9	83	
95134	170000	28.6141	80.6203	6			85	
95134	170000	28.6141	80.6203	12	51	6.0		
95134	170000	28.6141	80.6203	54	48	8.0	82	
95134	170000	28.4048	80.6519	6			88	77
95134	170000	28.4048	80.6519	54	62	6.0		
95134	170000	28.4600	80.5711	6			89	
95134	170000	28.4600	80.5711	12	49	5.1		
95134	170000	28.4600	80.5711	54	40	8.0	86	
95134	170000	28.6027	80.6414	6			86	
95134	170000	28.6027	80.6414	12	66	6.0		
95134	170000	28.6027	80.6414	54	60	8.0	84	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	170000	28.6105	80.6069	6				76
95134	170000	28.6105	80.6069	60	32	9.9	83	
95134	170000	28.6057	80.6016	6			85	77
95134	170000	28.6057	80.6016	60	50	8.9	83	
95134	170000	28.6294	80.6235	6				75
95134	170000	28.6294	80.6235	60	48	9.9	83	
95134	170000	28.6248	80.6182	6			84	76
95134	170000	28.6248	80.6182	60	54	8.9	83	
95134	170000	28.4586	80.5923	6			89	
95134	170000	28.4586	80.5923	12	5	4.1		
95134	170000	28.4586	80.5923	54	360	4.1	87	
95134	170000	28.6062	80.6739	6			88	
95134	170000	28.6062	80.6739	12	68	2.9		
95134	170000	28.6062	80.6739	54	49	2.9	87	
95134	170000	28.6586	80.6998	6			87	
95134	170000	28.6586	80.6998	12	38	4.1		
95134	170000	28.6586	80.6998	54	39	6.0	88	
95134	170000	28.7055	80.7265	6			87	77
95134	170000	28.7055	80.7265	54	38	2.9		
95134	170000	28.7755	80.8043	6			89	78
95134	170000	28.7755	80.8043	54	72	7.0		
95134	170000	28.5158	80.6400	6			87	
95134	170000	28.5158	80.6400	12	57	2.9		
95134	170000	28.5158	80.6400	54	62	6.0	85	
95134	170000	28.5623	80.6694	6			90	
95134	170000	28.5623	80.6694	12	341	1.0		
95134	170000	28.5623	80.6694	54	333	2.9	88	
95134	170000	28.5986	80.6817	6				
95134	170000	28.5986	80.6817	30	321	6.0		
95134	170000	28.6160	80.6930	6			92	73
95134	170000	28.6160	80.6930	30	293	2.9		
95134	170000	28.6307	80.7027	6				
95134	170000	28.6307	80.7027	30	0	2.9		
95134	170000	28.6431	80.7482	6			90	
95134	170000	28.6431	80.7482	12	338	2.9		
95134	170000	28.6431	80.7482	54	329	2.9	87	
95134	170000	28.4632	80.6702	6			90	
95134	170000	28.4632	80.6702	12	321	1.0		
95134	170000	28.4632	80.6702	54	307	1.9	89	
95134	170000	28.5184	80.6962	6			89	
95134	170000	28.5184	80.6962	12	314	1.9		
95134	170000	28.5184	80.6962	54	324	1.9	88	

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	170000	28.7464	80.8707	6			91	71
95134	170000	28.7464	80.8707	54	300	6.0		
95134	170000	28.4079	80.7604	6				
95134	170000	28.4079	80.7604	54				
95134	170000	28.5272	80.7742	6			88	76
95134	170000	28.5272	80.7742	54	52	5.1		
95134	170000	28.6056	80.8248	6				
95134	170000	28.6056	80.8248	54				
95134	170000	28.5697	80.5864	6			87	77
95134	170000	28.5697	80.5864	12	58	5.1		
95134	170000	28.5697	80.5864	54	56	8.9	85	
95134	170000	28.5697	80.5864	162	47	9.9		
95134	170000	28.5697	80.5864	204	40	8.9	83	
95134	170000	28.5697	80.5864	6			87	77
95134	170000	28.5697	80.5864	12	56	4.1		
95134	170000	28.5697	80.5864	54	53	8.9	84	
95134	170000	28.5697	80.5864	162	43	8.9		
95134	170000	28.5697	80.5864	204	39	8.9	83	
95134	170000	28.4843	80.7856	6			91	75
95134	170000	28.4843	80.7856	54	64	5.1		
95134	170000	28.6445	80.9034	6				
95134	170000	28.4114	80.9284	6			92	75
95134	170000	28.4114	80.9284	54	267	5.1		
95134	170000	28.4475	80.8538	6				
95134	170000	28.4960	80.8843	6				
95134	170000	28.4960	80.8843	54				
95134	170000	28.5583	80.9132	6				
95134	170000	28.6173	80.9581	6				
95134	170000	28.6173	80.9581	54				
95134	170000	28.6762	80.9987	6			93	73
95134	170000	28.6762	80.9987	54	289	8.0		
95134	170000	28.5231	81.0100	6			91	72
95134	170000	28.5231	81.0100	54	291	4.1		
95134	170000	28.6489	81.0693	6				
95134	170000	28.6489	81.0693	54				
95134	170000	28.4417	81.0291	6			93	72
95134	170000	28.4417	81.0291	54	310	5.1		

DAY	TIME	LAT	LON	Z	DIR	SPD	T	TD
95134	170000	28.6256	80.6571	6			89	75
95134	170000	28.6256	80.6571	12	34	4.1		
95134	170000	28.6256	80.6571	54	46	6.0	87	
95134	170000	28.6256	80.6571	162	37	6.0		
95134	170000	28.6256	80.6571	204	39	6.0	85	
95134	170000	28.6256	80.6571	295	41	7.0		
95134	170000	28.6256	80.6571	394	33	7.0		
95134	170000	28.6256	80.6571	492	21	6.0	83	
95134	170000	28.6256	80.6571	6			89	78
95134	170000	28.6256	80.6571	12	37	4.1		
95134	170000	28.6256	80.6571	54	43	4.1	87	
95134	170000	28.6256	80.6571	162	38	5.1		
95134	170000	28.6256	80.6571	204	41	5.1	85	
95134	170000	28.6256	80.6571	295	40	5.1		
95134	170000	28.6256	80.6571	394	35	5.1		
95134	170000	28.6256	80.6571	492	28	5.1	83	
95134	170000	28.3932	80.8211	6			92	72
95134	170000	28.3932	80.8211	54	319	4.1		
95134	170000	28.3382	80.7321	6			90	75
95134	170000	28.3382	80.7321	54	58	1.9		

RAWINSONDE DATA FROM PRIMARY WINDS SOURCE
CAPE CANAVERAL AFS, FLORIDA
07:32 Zulu Time, 14 MAY 95 (T - 6 hours and 13 minutes)

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	190	3.0	.000	24.0	22.3	1015.70	90	19.59	1178.88	379	675	26.86	0
1000	206	14.8	.020	25.7	17.7	981.83	62	14.75	1135.64	340	676	20.34	6
2000	208	13.2	.003	24.1	16.0	948.45	60	13.23	1103.42	324	675	18.15	10
3000	215	8.8	.008	21.6	17.8	915.99	79	14.99	1073.65	329	672	20.39	14
4000	241	4.0	.009	19.4	16.7	884.41	85	14.09	1044.75	318	669	19.03	18
5000	302	3.4	.006	16.6	15.4	853.66	93	13.13	1018.43	307	666	17.56	22
6000	333	4.7	.004	14.2	13.3	823.69	94	11.53	991.66	292	663	15.29	26
7000	359	5.5	.004	12.4	11.0	794.56	91	9.98	963.30	276	661	13.15	29
8000	21	6.1	.004	10.2	8.3	766.23	88	8.37	936.98	261	658	10.94	32
9000	17	6.6	.001	10.7	.8	738.81	50	4.94	903.74	232	658	6.47	34
10000	352	7.3	.005	10.4	-4.3	712.34	35	3.41	873.06	216	657	4.47	35
11000	337	7.2	.003	8.4	-7.2	686.70	33	2.75	848.11	206	655	3.57	36
12000	338	7.1	.000	6.0	-9.3	661.78	32	2.35	824.58	198	652	3.03	37
13000	337	7.5	.001	3.9	-11.3	637.58	32	2.01	800.41	191	649	2.57	38
14000	325	7.2	.003	2.0	-13.0	614.10	32	1.77	776.57	184	647	2.25	38
15000	311	6.9	.003	-.6	-15.1	591.28	32	1.51	754.82	178	644	1.90	39
16000	318	7.9	.002	-2.9	-17.9	569.13	30	1.20	732.99	171	641	1.49	39
17000	337	10.8	.007	-4.9	-20.1	547.63	29	1.00	710.60	165	639	1.24	39
18000	344	13.5	.005	-6.4	-21.7	526.81	28	.87	687.57	159	637	1.08	40
19000	339	13.9	.002	-8.7	-23.9	506.65	28	.72	667.04	153	634	.88	40
20000	328	14.2	.004	-10.1	-28.5	487.14	20	.48	644.77	147	632	.58	40
21000	313	14.0	.006	-12.5	-30.3	468.23	21	.41	625.52	142	629	.49	40
22000	299	13.5	.006	-14.7	-30.6	449.89	24	.40	606.17	138	627	.48	40
23000	291	13.3	.003	-16.9	-33.8	432.13	21	.29	587.38	133	624	.35	40
24000	289	13.4	.001	-19.7	-30.0	414.91	39	.43	570.08	130	621	.50	40
25000	290	13.6	.001	-22.1	-33.4	398.21	35	.31	552.36	125	618	.36	41
26000	297	12.7	.003	-24.7	-37.2	382.02	30	.22	535.52	121	615	.25	41
27000	309	11.2	.005	-27.2	-41.1	366.34	25	.14	518.89	117	611	.16	41
28000	321	11.2	.004	-29.7	-41.9	351.14	29	.13	502.36	113	608	.15	41
29000	331	12.5	.004	-31.9	-44.0	336.45	29	.11	485.79	109	605	.12	41
30000	339	12.9	.003	-34.4	-46.4	322.24	28	.08	470.15	105	602	.09	41
31000	348	13.0	.003	-36.9	-48.6	308.48	28	.07	454.95	102	599	.07	41

TERMINATION 32177 GEOPFT 9807 GEOPM 291.6 MBS

RAWINSONDE DATA FROM PRIMARY WINDS SOURCE
CAPE CANAVERAL AFS, FLORIDA
12:22 Zulu Time, 14 MAY 95 (T - 1 hour and 23 minutes)

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	250	5.0	.000	27.1	23.6	1016.40	81	20.97	1166.55	383	679	29.06	0
1000	232	9.2	.008	25.6	21.7	982.53	79	18.89	1134.34	364	677	26.04	6
2000	225	10.0	.002	24.7	19.7	949.23	74	16.68	1100.20	344	676	22.93	11
3000	224	9.7	.001	22.5	18.4	916.86	78	15.51	1070.86	331	673	21.16	16
4000	222	7.7	.003	19.8	17.4	885.34	86	14.67	1043.87	321	670	19.84	21
5000	230	4.6	.005	17.7	15.0	854.63	84	12.71	1015.78	303	667	17.06	25
6000	255	2.3	.005	16.1	11.3	824.78	73	10.05	987.28	281	665	13.41	28
7000	257	1.2	.002	14.6	4.3	795.76	51	6.41	959.37	253	663	8.52	31
8000	212	1.0	.001	12.9	2.4	767.58	49	5.52	931.59	242	660	7.29	32
9000	167	.7	.001	11.1	3.3	740.23	59	5.91	903.50	238	659	7.76	34
10000	25	2.1	.005	9.9	-2.4	713.71	42	3.94	875.93	220	657	5.15	36
11000	22	4.6	.004	9.2	-8.1	688.04	29	2.56	847.54	205	656	3.33	37
12000	26	6.6	.003	7.4	-10.4	663.17	27	2.14	822.21	197	653	2.77	37
13000	20	8.2	.003	5.7	-13.1	639.04	24	1.73	797.45	189	651	2.23	38
14000	358	9.1	.006	3.4	-15.0	615.64	25	1.50	774.62	182	649	1.91	38
15000	348	11.4	.005	1.3	-15.7	592.90	27	1.42	751.65	177	646	1.80	39
16000	355	13.6	.004	-1.1	-20.1	570.82	22	.99	730.43	169	643	1.25	39
17000	5	14.7	.005	-3.5	-23.6	549.38	19	.73	709.23	163	640	.91	39
18000	10	15.7	.003	-5.4	-23.0	528.59	23	.77	687.33	158	638	.96	40
19000	3	15.2	.003	-7.3	-24.2	508.46	24	.70	665.96	153	636	.86	40
20000	352	14.2	.005	-9.2	-25.6	488.94	25	.62	644.84	148	634	.76	40
21000	346	14.0	.003	-11.4	-27.6	470.03	25	.52	625.29	143	631	.63	40

TERMINATION 22353 GEOPFT 6813 GEOPM 444.4 MBS

RAWINSONDE DATA FROM PRIMARY WINDS SOURCE
CAPE CANAVERAL AFS, FLORIDA
13:27 Zulu Time, 14 MAY 95 (T - 18 minutes)

ALT GEOMFT	DIR DEG	SPD KTS	SHR /SEC	TEMP DEG C	DPT DEG C	PRESS MBS	RH PCT	ABHUM G/M3	DENSITY G/M3	I/R N	V/S KTS	VPS MBS	PW MM
16	270	6.0	.000	29.5	23.9	1016.70	72	21.26	1157.37	382	682	29.69	0
1000	256	8.8	.006	26.1	22.5	982.95	81	19.75	1132.39	369	678	27.27	6
2000	239	9.5	.005	25.2	20.1	949.70	73	17.08	1098.48	346	676	23.51	12
3000	231	9.3	.002	22.8	18.2	917.37	75	15.28	1070.54	329	674	20.87	16
4000	237	7.8	.003	20.2	17.2	885.85	83	14.53	1043.08	320	670	19.67	21
5000	253	5.2	.005	18.3	14.8	855.18	80	12.54	1014.51	302	668	16.87	25
6000	276	2.8	.005	17.1	11.8	825.39	71	10.35	984.40	282	666	13.86	29
7000	283	2.0	.001	15.5	3.2	796.44	45	5.96	957.76	250	663	7.94	31
8000	266	2.7	.002	13.2	4.2	768.29	54	6.26	930.99	246	661	8.28	33
9000	278	2.6	.001	11.5	3.1	740.96	56	5.82	903.41	237	659	7.65	34
10000	336	3.5	.005	10.3	-4.1	714.44	36	3.49	875.93	217	657	4.57	36
11000	356	5.1	.004	9.0	-7.3	688.74	31	2.71	848.72	206	655	3.52	37
12000	11	5.7	.003	7.3	-9.5	663.84	29	2.31	823.25	198	653	2.99	38
13000	24	7.1	.003	4.9	-11.6	639.66	29	1.96	800.14	191	651	2.52	38
14000	17	8.1	.002	2.4	-14.7	616.16	27	1.54	778.09	183	647	1.96	39
15000	6	9.7	.004	.5	-16.5	593.34	27	1.33	754.61	177	645	1.68	39
16000	2	11.6	.003	-1.8	-19.2	571.19	25	1.08	732.67	170	642	1.35	40
17000	357	12.3	.002	-3.4	-24.1	549.71	18	.70	709.45	163	640	.87	40
18000	359	12.4	.001	-5.7	-24.2	528.91	22	.70	688.43	158	638	.86	40
19000	360	12.9	.001	-7.6	-24.8	508.73	24	.67	667.06	153	635	.82	40
20000	353	13.7	.003	-9.5	-25.6	489.17	26	.63	646.12	148	633	.76	40
21000	348	14.4	.002	-11.8	-27.3	470.23	26	.54	626.44	143	630	.65	41
22000	348	15.8	.002	-13.5	-30.7	451.89	22	.39	606.13	138	628	.47	41
23000	349	16.8	.002	-16.1	-32.4	434.11	23	.34	588.07	133	625	.40	41
24000	350	18.6	.003	-17.5	-35.2	416.91	20	.26	568.04	128	623	.30	41
25000	352	21.0	.004	-20.2	-37.1	400.26	20	.21	551.17	124	620	.25	41
26000	354	21.7	.002	-22.6	-39.0	384.11	21	.18	534.06	120	617	.21	41
27000	354	18.6	.005	-25.0	-40.9	368.48	21	.15	517.24	116	614	.17	41
28000	353	15.4	.005	-27.8	-42.8	353.32	22	.12	501.52	113	611	.14	41
29000	352	13.4	.003	-30.5	-44.7	338.63	23	.10	486.21	109	607	.11	41
30000	351	12.0	.002	-33.1	-46.5	324.40	25	.08	470.77	105	604	.09	41
31000	352	10.1	.003	-36.0	-48.6	310.61	26	.07	456.24	102	600	.07	41
32000	357	9.4	.002	-38.4	-51.4	297.27	23	.05	441.06	99	597	.05	41
33000	353	9.1	.001	-40.8	-53.3	284.37	24	.04	426.32	95	594	.04	41
34000	339	8.7	.004	-43.4	-55.4	271.90	25	.03	412.27	92	591	.03	41
35000	325	10.8	.005	-46.0	-57.5	259.86	25	.02	398.50	89	588	.02	41
36000	328	17.2	.011	-48.3	-59.3	248.21	26	.02	384.64	86	584	.02	41
37000	333	23.9	.012	-49.4	-60.4	237.01	26	.02	369.09	82	583	.02	41
38000	338	28.4	.008	-52.0	-62.7	226.23	26	.01	356.43	79	580	.01	41

TERMINATION 39685 GEOPFT 12096 GEOPM 207.6 MBS

Mosquito Lagoon
Latitude/Longitude 28.60 80.59 3
Date 95 05 14 **Time(hrs., min., secs.)** 12 15 11 0
5
11 6 2.0
10 32 700 20
409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	27.8	11
0.218	28.3	11
0.322	28.3	11
0.428	28.1	11
0.533	27.6	11
0.637	27.3	11
0.743	26.8	11
0.848	26.0	11
0.952	25.0	11
1.058	23.7	11
1.163	23.0	10
1.268	22.0	10
1.372	20.3	7
1.477	20.6	8

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 12 20 25 0

10

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	4.1	316	-1.64	-0.23	-0.05	6	7	8	25	19	16
0.214	4.3	305	-1.78	0.01	-0.14	7	7	8	26	23	27
0.311	5.3	322	-2.01	-0.42	0.01	7	7	8	26	19	17
0.407	4.0	303	-1.63	0.11	-0.08	7	7	8	20	17	21
0.504	4.2	273	-1.23	1.04	0.07	6	6	8	11	8	11
0.601	5.0	235	-0.38	2.00	0.13	6	6	8	-1	0	9
0.697	5.3	228	-0.30	2.04	-0.01	8	7	8	6	6	10
0.794	5.4	227	-0.29	2.04	-0.05	8	7	8	0	0	-0
0.891	4.4	233	-0.25	1.80	0.15	8	7	8	-8	-6	0
0.987	4.5	228	-0.12	1.83	0.11	8	7	8	-7	-7	-4
1.084	4.7	222	0.01	1.93	0.08	8	7	8	-7	1	-6
1.181	4.4	227	0.03	1.96	0.26	8	7	8	-7	-4	-10
1.277	4.3	226	-0.07	1.75	0.11	8	7	8	-10	-8	-3
1.374	4.1	230	-0.32	1.55	-0.03	8	7	8	-4	-1	-5
1.471	3.9	251	-0.58	1.49	0.21	8	7	6	-3	-2	-13
1.567	4.7	245	-0.98	1.45	-0.23	8	7	5	-5	-9	-15
1.664	3.9	260	-0.99	1.16	-0.07	8	6	4	-12	-13	-17
1.760	3.3	258	-0.85	0.93	-0.08	6	5	8	-12	-14	1
1.857	3.3	251	-0.73	1.06	-0.06	8	7	8	-8	-8	3
1.954	2.3	255	-0.54	0.71	-0.02	8	7	8	4	-1	3
2.050	1.4	279	-0.52	0.25	-0.04	8	7	8	13	2	-8
2.147	1.8	308	-0.63	0.09	0.07	8	7	8	11	1	-10
2.244	1.7	319	-0.62	-0.08	0.02	8	7	8	3	-3	-7
2.340	0.2	349	0.01	0.02	0.06	8	7	8	0	-3	-3
2.437	0.9	181	0.26	0.31	0.05	8	7	8	2	1	-2
2.534	1.4	189	0.27	0.46	-0.01	8	7	8	3	3	-3
2.630	1.7	193	0.25	0.54	-0.04	8	7	8	1	1	-9
2.727	1.7	194	0.19	0.49	-0.12	8	7	8	1	0	-11
2.824	1.5	194	0.20	0.46	-0.07	8	7	6	-3	-2	-13
2.920	2.5	187	0.18	0.47	-0.38	8	7	5	-7	-6	-16
3.017	4.0	164	0.29	-0.14	-1.10	8	7	5	-8	-11	-19
3.114	1.6	61	0.22	-0.57	-1.35	8	7	3	-11	-14	-17

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 12 30 02 0
5

10 5 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	**Virtual Temp. (°C)**	
0.112	27.7	10
0.218	27.7	10
0.322	27.7	10
0.428	27.8	10
0.533	27.5	10
0.637	27.0	10
0.743	26.5	10
0.848	25.6	10
0.952	24.6	10
1.058	23.6	10
1.163	22.6	10
1.268	21.7	10
1.372	21.0	10
1.477	21.3	7

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 12 35 19 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	3.4	300	-1.44	0.09	-0.16	8	8	8	23	17	20
0.214	2.9	290	-1.35	0.09	-0.32	8	8	8	23	23	24
0.311	3.2	305	-1.46	-0.10	-0.23	8	8	8	25	18	21
0.407	2.9	286	-1.25	0.23	-0.24	8	8	8	19	18	18
0.504	3.7	259	-1.11	0.93	-0.22	8	7	8	8	8	5
0.601	4.7	238	-0.49	1.83	0.08	8	8	8	-1	9	2
0.697	4.5	233	-0.30	1.80	0.10	8	8	8	5	4	2
0.794	5.0	231	-0.32	1.97	0.06	7	8	8	-1	-1	2
0.891	4.0	241	-0.41	1.58	0.14	7	8	8	-3	-1	-3
0.987	4.3	236	-0.40	1.69	0.07	8	8	8	-1	-1	-3
1.084	4.5	231	-0.32	1.75	0.03	8	8	8	-1	-0	-5
1.181	4.6	232	-0.25	1.89	0.13	8	8	8	-4	-1	-7
1.277	3.5	233	-0.20	1.43	0.11	8	7	8	-5	5	-7
1.374	3.8	248	-0.54	1.46	0.16	8	8	8	-5	0	-8
1.471	4.2	255	-0.77	1.54	0.21	8	8	8	-4	-5	-15
1.567	4.1	256	-0.84	1.39	0.10	8	8	7	-9	-5	-13
1.664	3.3	260	-0.83	1.00	1.36	8	8	2	-10	-10	-18
1.760	3.3	263	-0.79	1.00	0.08	7	8	8	-13	-12	-10
1.857	3.1	261	-0.77	0.94	0.03	8	8	8	-11	-13	-0
1.954	2.4	261	-0.63	0.72	-0.01	8	8	8	1	-6	6
2.050	1.7	293	-0.67	0.17	-0.03	8	8	8	10	1	-5
2.147	2.4	315	-0.82	0.04	0.12	8	8	7	8	2	-9
2.244	2.0	309	-0.81	-0.03	-0.05	8	8	8	-0	-4	-6
2.340	0.8	290	-0.34	0.07	-0.04	8	8	8	-5	-3	-5
2.437	0.7	250	-0.12	0.27	0.02	8	8	8	-5	2	-6
2.534	1.1	234	-0.12	0.39	-0.02	8	8	8	-4	1	-3
2.630	1.6	234	-0.19	0.55	-0.04	8	8	8	-0	1	-7
2.727	1.9	233	-0.27	0.61	-0.11	8	8	7	1	1	-12
2.824	2.4	219	-0.31	0.59	-0.36	8	8	5	-1	-1	-16
2.920	1.7	248	-0.31	0.57	7.95	8	8	3	-5	-5	-18
3.017	1.6	246	-0.28	0.57	-0.17	8	8	3	-11	-12	-18
3.114	1.0	357	-0.26	-0.28	8.90	8	8	3	-14	-15	-18

Mosquito Lagoon
Latitude/Longitude 28.60 80.59 3
Date 95 05 14 **Time(hrs., min., secs.)** 12 45 27 0
4
10 5 2.0
10 32 700 20
409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	27.8	10
0.218	27.8	10
0.322	27.8	10
0.428	27.8	10
0.533	27.5	10
0.637	27.0	10
0.743	26.5	10
0.848	25.7	10
0.952	24.7	10
1.058	23.8	10
1.163	22.7	10
1.268	21.8	10
1.372	20.9	10
1.477	20.4	9

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 12 50 14 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	4.1	311	-1.63	-0.04	-0.02	7	8	7	20	16	19
0.214	3.2	295	-1.23	0.31	-0.02	7	8	7	26	23	25
0.311	4.6	321	-1.75	-0.33	0.01	7	8	7	21	17	20
0.407	3.7	298	-1.39	0.32	0.03	8	8	7	20	17	19
0.504	3.6	287	-1.22	0.65	0.10	8	8	7	8	6	6
0.601	4.7	245	-0.56	1.90	0.25	8	8	8	2	3	-4
0.697	3.9	225	-0.01	1.63	0.14	7	8	8	4	-2	4
0.794	4.3	237	-0.35	1.73	0.14	8	8	8	7	4	0
0.891	3.9	235	-0.22	1.64	0.19	8	8	8	3	-0	-4
0.987	3.8	238	-0.22	1.64	0.24	8	8	8	0	-4	-6
1.084	4.0	238	-0.27	1.70	0.23	7	8	8	-7	-3	-7
1.181	4.3	235	-0.29	1.75	0.16	7	8	8	-7	-1	-3
1.277	4.2	225	-0.01	1.80	0.16	7	8	8	-3	4	-2
1.374	4.2	241	-0.38	1.75	0.21	8	8	8	-2	0	-9
1.471	4.5	245	-0.63	1.70	0.13	8	8	7	-8	-5	-11
1.567	4.1	252	-0.75	1.43	0.09	8	8	8	-11	-10	-12
1.664	3.4	252	-0.70	1.14	-4.74	8	8	4	-7	-10	-18
1.760	3.3	261	-0.77	1.08	0.11	8	8	8	-10	-10	-4
1.857	2.9	267	-0.67	0.95	0.18	8	7	8	-8	-7	7
1.954	2.3	295	-0.69	0.39	0.18	8	8	8	4	2	4
2.050	2.3	303	-0.76	0.25	0.15	8	8	8	9	8	-8
2.147	2.9	312	-0.87	0.21	0.27	8	8	8	7	4	-10
2.244	2.6	314	-0.83	0.12	0.20	8	8	8	-1	-3	-6
2.340	1.7	309	-0.50	0.19	0.19	8	8	8	-8	-1	-4
2.437	1.1	296	-0.20	0.30	0.22	8	8	8	-8	2	2
2.534	1.5	277	-0.26	0.53	0.24	8	8	8	-1	0	-0
2.630	2.0	263	-0.31	0.78	0.23	8	8	8	2	2	-5
2.727	2.0	262	-0.33	0.80	0.22	8	8	6	2	2	-12
2.824	2.3	244	-0.36	0.81	-2.30	8	8	3	-0	-1	-19
2.920	2.2	251	-0.38	0.82	0.08	8	8	5	-5	-6	-17
3.017	2.2	246	-0.38	0.78	2.10	8	7	2	-12	-14	-18
3.114	9999.0	9999	1.92	0.53	-7.83	3	3	2	-19	-18	-19

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 13 00 23 0

4

10 5 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	27.5	10
0.218	27.5	10
0.322	27.8	10
0.428	27.9	10
0.533	27.7	10
0.637	27.0	10
0.743	26.5	10
0.848	25.8	10
0.952	24.9	10
1.058	23.8	10
1.163	22.9	10
1.268	22.0	10
1.372	20.8	10
1.477	20.5	6

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 13 05 09 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	4.7	319	-1.76	-0.23	0.07	7	7	8	27	24	20
0.214	4.4	312	-1.67	-0.03	0.04	8	8	8	28	27	27
0.311	5.4	322	-2.02	-0.42	0.04	7	7	8	29	22	19
0.407	4.3	315	-1.68	-0.13	0.01	8	7	8	25	22	21
0.504	5.5	317	-2.11	-0.23	0.02	7	8	8	14	8	9
0.601	5.0	264	-1.16	1.57	0.19	7	7	8	3	2	-1
0.697	5.1	254	-1.09	1.68	0.03	7	7	8	2	6	3
0.794	4.5	241	-0.58	1.71	0.07	8	8	8	2	2	5
0.891	3.8	242	-0.43	1.52	0.15	8	8	8	-0	1	4
0.987	4.4	237	-0.41	1.73	0.11	8	8	8	-2	5	-6
1.084	3.9	227	-0.16	1.54	0.04	7	8	8	2	0	-4
1.181	4.1	233	-0.33	1.60	0.04	8	8	8	5	-0	0
1.277	4.2	238	-0.44	1.61	0.07	8	8	8	1	1	-5
1.374	4.8	239	-0.66	1.71	-0.06	8	8	8	-3	-4	-7
1.471	4.6	255	-1.08	1.43	-0.05	8	8	8	-8	-8	-8
1.567	4.5	256	-1.10	1.34	-0.08	8	8	8	-9	-11	-11
1.664	4.1	264	-1.03	1.23	0.10	8	8	6	-8	-10	-13
1.760	4.0	261	-1.05	1.14	-0.04	7	7	8	-10	-13	-3
1.857	2.6	267	-0.79	0.63	-0.06	8	8	8	-3	-6	8
1.954	2.2	284	-0.84	0.31	-0.07	8	8	8	9	5	0
2.050	2.6	295	-0.99	0.24	-0.03	8	8	8	10	8	-9
2.147	3.0	304	-1.07	0.20	0.08	8	8	8	3	3	-8
2.244	2.3	318	-0.69	0.06	0.20	8	8	8	-5	-5	-7
2.340	0.9	285	-0.27	0.19	0.05	8	8	8	-3	-2	-6
2.437	1.2	272	-0.28	0.37	0.09	8	8	8	-3	1	-1
2.534	1.9	267	-0.41	0.62	0.14	8	8	8	-3	-0	1
2.630	2.3	262	-0.53	0.76	0.08	8	8	8	1	-0	-10
2.727	2.6	259	-0.63	0.78	-4.25	8	8	3	1	2	-18
2.824	2.8	260	-0.72	0.85	-1.51	8	8	3	-2	-0	-20
2.920	2.8	256	-0.65	0.88	1.69	8	8	4	-8	-7	-17
3.017	9999.0	9999	-0.72	-0.03	-5.92	8	4	3	-10	-14	-19
3.114	9999.0	9999	-0.39	-0.50	-6.11	4	8	2	-15	-17	-17

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 13 15 17 0

5

11 6 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	28.5	11
0.218	27.9	11
0.322	27.8	11
0.428	27.6	11
0.533	27.5	11
0.637	27.0	11
0.743	26.3	11
0.848	25.7	11
0.952	24.9	11
1.058	24.0	11
1.163	23.0	11
1.268	22.1	10
1.372	21.3	11
1.477	20.3	9

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 13 20 31 0

9

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	4.8	314	-2.01	-0.27	-0.16	8	7	8	24	23	29
0.214	4.4	304	-1.98	-0.11	-0.31	8	7	8	29	27	28
0.311	4.9	316	-2.27	-0.57	-0.41	8	7	8	25	24	31
0.407	4.3	304	-1.98	-0.16	-0.36	8	7	8	24	21	25
0.504	4.3	298	-1.92	0.08	-0.29	8	7	8	12	12	20
0.601	4.7	266	-1.47	1.14	-0.15	8	7	8	5	7	8
0.697	4.9	247	-0.93	1.62	-0.09	8	6	8	2	-2	-2
0.794	4.0	243	-0.66	1.38	-0.05	8	7	7	3	-1	-2
0.891	4.2	238	-0.51	1.56	0.01	8	7	7	1	-4	-1
0.987	4.0	240	-0.44	1.59	0.12	8	7	8	3	-1	1
1.084	4.3	236	-0.44	1.64	0.04	8	7	8	2	0	3
1.181	4.5	234	-0.47	1.65	-0.06	8	7	8	-1	-1	-3
1.277	4.7	233	-0.45	1.76	-0.04	8	7	8	-5	-6	-8
1.374	4.4	243	-0.70	1.53	-0.05	8	7	8	-5	-9	-11
1.471	5.3	264	-1.42	1.50	0.02	7	7	6	-10	-13	-9
1.567	4.5	268	-1.35	1.12	-0.06	8	6	8	-11	-16	-11
1.664	4.2	259	-1.06	1.22	-0.05	8	7	8	-11	-8	-5
1.760	3.8	272	-1.23	0.88	-0.05	8	7	8	-7	-5	-0
1.857	3.7	270	-1.18	0.87	-0.08	8	7	8	-2	-1	6
1.954	2.7	284	-1.03	0.39	-0.08	8	7	8	7	4	-4
2.050	2.9	290	-1.15	0.30	-0.11	8	7	7	9	4	-12
2.147	2.9	287	-1.25	0.22	-0.24	8	7	8	2	-3	-13
2.244	1.8	304	-0.75	0.03	-0.05	8	7	8	-4	-11	-8
2.340	1.0	277	-0.31	0.22	0.01	8	7	8	-0	-4	-7
2.437	1.1	260	-0.28	0.35	0.01	8	7	8	1	2	-3
2.534	1.6	255	-0.36	0.49	-0.01	8	7	8	-3	0	2
2.630	2.3	246	-0.52	0.71	-0.12	8	7	8	-0	-2	-7
2.727	2.5	262	-0.66	0.74	9.05	8	7	2	3	0	-18
2.824	2.7	265	-0.75	0.75	-6.55	8	7	2	-0	-2	-17
2.920	2.6	267	-0.74	0.70	9.26	8	7	3	-6	-7	-18
3.017	2.0	258	-0.49	0.62	1.53	8	7	3	-11	-14	-19
3.114	9999.0	9999	-0.04	-6.92	-2.34	7	3	3	-18	-17	-15

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 13 30 14 0

5

11 6 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	27.9	11
0.218	27.9	11
0.322	27.7	11
0.428	27.6	11
0.533	27.3	11
0.637	27.0	11
0.743	26.4	11
0.848	25.8	11
0.952	25.0	11
1.058	24.1	11
1.163	23.1	11
1.268	22.4	10
1.372	21.3	9
1.477	20.5	6

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 13 35 29 0

9

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67 0.117 5.0 326 -1.77 -0.44 0.13 8 7 8

25

20 24

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.214	5.1	319	-1.87	-0.21	0.12	8	7	8	28	26	31
0.311	5.7	331	-1.92	-0.65	0.18	8	7	8	26	20	24
0.407	5.4	321	-1.95	-0.29	0.12	8	7	8	23	21	26
0.504	4.9	294	-1.97	0.40	-0.15	8	6	8	13	21	13
0.601	4.4	270	-1.43	1.02	-0.11	8	7	8	11	13	8
0.697	4.6	265	-1.24	1.28	0.03	8	7	8	4	2	-0
0.794	4.0	242	-0.63	1.37	-0.07	8	7	8	3	-0	-2
0.891	4.1	242	-0.60	1.50	0.01	8	7	8	-4	3	-6
0.987	4.1	237	-0.47	1.51	-0.02	8	7	8	-1	-2	-3
1.084	4.3	238	-0.51	1.62	0.03	8	7	8	3	-2	-2
1.181	4.7	234	-0.54	1.69	-0.09	8	7	8	2	-1	-3
1.277	5.1	229	-0.43	1.82	-0.15	8	7	8	-1	-4	1
1.374	4.8	241	-0.79	1.64	-0.14	8	7	8	-7	-7	-6
1.471	4.7	257	-1.12	1.46	-0.00	8	7	8	-7	-6	-11
1.567	4.9	259	-1.39	1.28	-0.22	8	6	7	-8	-7	-4
1.664	4.6	267	-1.43	1.11	-0.12	8	7	8	-5	-11	-6
1.760	4.1	275	-1.29	0.95	0.04	8	7	8	-8	-7	1
1.857	3.6	280	-1.14	0.78	0.08	8	7	8	1	-2	7
1.954	3.2	286	-1.10	0.57	0.07	8	7	8	7	6	-2
2.050	3.4	288	-1.21	0.53	0.03	8	7	8	6	7	-10
2.147	3.4	290	-1.21	0.48	0.03	8	7	8	-1	0	-10
2.244	2.4	284	-0.84	0.44	0.02	8	7	8	-6	-9	-5
2.340	1.3	280	-0.40	0.32	0.06	8	7	8	-2	-4	-5
2.437	1.5	267	-0.36	0.46	0.07	8	7	8	1	-0	-3
2.534	2.0	258	-0.42	0.69	0.07	8	7	8	-1	-0	1
2.630	2.7	256	-0.57	0.90	0.05	8	7	8	-3	-1	-6
2.727	3.1	278	-0.79	0.90	0.27	8	7	6	-2	-2	-12
2.824	3.1	266	-0.87	0.83	-0.00	8	7	5	-3	-3	-16
2.920	2.9	266	-0.83	0.80	-5.30	8	7	3	-6	-7	-18
3.017	2.2	260	-0.56	0.67	-5.56	8	7	2	-10	-14	-19
3.114	9999.0	9999	-0.48	-0.27	-3.50	8	3	2	-13	-18	-19

Mosquito Lagoon
Latitude/Longitude 28.60 80.59 3
Date 95 05 14 **Time(hrs., min., secs.)** 13 45 11 0
5
11 6 2.0
10 32 700 20
409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	28.4	11
0.218	28.1	11
0.322	27.8	11
0.428	27.6	11
0.533	27.1	11
0.637	26.9	11
0.743	26.4	11
0.848	25.9	11
0.952	25.1	11
1.058	24.1	11
1.163	23.4	11
1.268	22.1	8
1.372	9999.0	5
1.477	9999.0	5

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 13 50 26 0

9

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	5.6	322	-2.13	-0.46	0.01	7	7	8	22	21	27
0.214	5.5	327	-2.00	-0.58	0.04	7	7	8	27	24	27
0.311	5.8	323	-2.26	-0.56	-0.04	8	7	8	25	23	29
0.407	5.7	326	-2.27	-0.73	-0.13	7	7	8	24	21	27
0.504	5.5	326	-2.19	-0.70	-0.13	8	7	8	18	12	19
0.601	4.5	311	-2.07	-0.36	-0.35	8	7	8	10	12	8
0.697	4.2	289	-1.38	0.73	0.16	8	7	8	9	7	2
0.794	3.8	279	-1.19	0.84	0.08	8	7	7	2	3	7
0.891	3.6	255	-0.62	1.35	0.20	7	6	8	2	-0	6
0.987	4.0	245	-0.52	1.58	0.16	8	7	8	1	-0	-3
1.084	4.1	242	-0.52	1.58	0.08	8	7	8	-8	-2	-4
1.181	4.6	249	-0.83	1.63	0.06	8	7	8	-9	-6	-4
1.277	4.9	246	-0.81	1.77	0.05	8	7	8	-6	-4	-3
1.374	5.2	243	-0.82	1.82	-0.03	8	7	8	-3	-2	-3
1.471	5.1	254	-1.12	1.65	0.01	8	7	8	-5	-5	-4
1.567	4.9	268	-1.40	1.28	0.02	8	7	8	-3	-4	-13
1.664	4.3	281	-1.41	0.89	0.08	8	7	8	-8	-8	-12
1.760	3.6	280	-1.16	0.77	0.07	8	7	8	-5	-9	0
1.857	3.4	284	-1.16	0.62	0.04	8	7	8	-2	-3	8
1.954	3.5	291	-1.25	0.48	0.05	8	7	8	8	6	2
2.050	3.8	297	-1.38	0.40	0.06	8	7	8	10	7	-8
2.147	4.0	299	-1.49	0.34	0.05	8	7	8	4	1	-10
2.244	3.2	300	-1.23	0.23	0.02	8	7	8	-4	-8	-8
2.340	1.9	289	-0.68	0.29	0.02	8	7	8	-4	-2	-7
2.437	1.8	271	-0.57	0.40	-0.04	8	7	8	-1	-0	-6
2.534	2.4	257	-0.64	0.68	-0.08	8	7	8	-1	-1	-2
2.630	2.9	253	-0.72	0.87	-0.10	8	7	8	-4	-4	-3
2.727	3.1	268	-0.97	0.72	-0.09	8	7	8	-3	-1	-14
2.824	3.5	276	-1.12	0.75	1.50	8	7	4	-1	-1	-19
2.920	3.5	275	-1.11	0.79	1.97	8	7	3	-5	-5	-19
3.017	2.9	269	-0.87	0.75	-2.49	8	7	3	-11	-12	-17
3.114	9999.0	9999	-0.59	9.29	-8.60	7	2	2	-14	-20	-20

Mosquito Lagoon
Latitude/Longitude 28.60 80.59 3
Date 95 05 14 **Time(hrs., min., secs.)** 14 00 09 0
5
11 6 2.0
10 32 700 20
409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	27.9	11
0.218	27.7	11
0.322	27.4	11
0.428	27.2	11
0.533	27.0	11
0.637	26.4	11
0.743	26.1	11
0.848	25.6	11
0.952	25.0	11
1.058	24.1	11
1.163	23.2	11
1.268	22.0	10
1.372	21.3	9
1.477	19.8	8

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 14 05 23 0

10

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	6.2	323	-2.24	-0.40	0.13	7	7	8	26	22	25
0.214	5.2	322	-1.88	-0.30	0.12	7	7	8	27	25	29
0.311	5.6	328	-2.01	-0.57	0.10	8	7	8	28	23	28
0.407	6.3	327	-2.23	-0.63	0.11	7	7	8	27	22	27
0.504	6.8	328	-2.46	-0.76	0.06	7	7	8	22	14	18
0.601	6.2	327	-2.32	-0.70	-0.01	8	7	8	15	6	9
0.697	4.4	293	-1.55	0.60	0.11	8	7	8	8	7	9
0.794	4.6	282	-1.41	1.02	0.18	8	7	8	8	2	-2
0.891	4.5	275	-1.15	1.31	0.31	8	7	8	3	-2	-3
0.987	4.7	258	-0.86	1.72	0.30	7	7	8	-3	-2	-9
1.084	4.6	246	-0.56	1.83	0.24	8	7	8	-7	-8	-10
1.181	5.3	250	-0.85	1.98	0.21	8	7	8	-8	-9	-2
1.277	5.2	255	-0.89	1.95	0.30	8	7	8	-5	-6	-9
1.374	5.6	251	-0.94	2.07	0.19	8	7	8	-8	-8	-5
1.471	5.3	265	-1.28	1.68	0.23	8	7	8	-5	-7	-2
1.567	5.2	270	-1.38	1.46	0.18	8	7	8	-0	-2	-9
1.664	4.9	269	-1.30	1.42	0.16	8	7	8	-5	-5	-12
1.760	3.8	270	-1.04	1.05	0.11	8	7	8	-8	-6	5
1.857	2.9	286	-1.00	0.52	0.06	8	7	8	-0	-0	8
1.954	3.1	291	-1.11	0.42	0.02	8	7	8	8	7	-1
2.050	3.3	298	-1.25	0.30	0.02	8	7	8	8	6	-8
2.147	3.6	307	-1.33	0.17	0.10	8	7	8	1	-0	-8
2.244	2.7	309	-0.97	0.09	0.09	8	7	8	-4	-8	-7
2.340	2.2	299	-0.70	0.30	0.14	8	7	8	-2	-5	-4
2.437	2.6	286	-0.74	0.60	0.20	8	7	8	-1	-2	13
2.534	3.1	274	-0.78	0.89	0.20	8	7	8	-1	-1	7
2.630	3.5	270	-0.92	1.02	0.15	8	7	8	-3	-2	-3
2.727	3.9	284	-1.05	1.01	0.35	8	7	8	0	2	-13
2.824	4.3	270	-1.27	1.07	0.94	8	7	4	1	3	-17
2.920	4.5	271	-1.35	1.11	6.51	8	7	2	-3	-2	-18
3.017	4.2	272	-1.29	1.01	1.50	8	7	3	-9	-9	-17
3.114	3.5	278	-1.15	0.73	-7.41	8	5	2	-15	-14	-17

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 1 14 15 00 0

5

10 5 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)		
0.112	28.6	10	
0.218	28.4	10	
0.322	28.0	10	
0.428	27.1	10	
0.533	26.6	10	
0.637	26.2	10	
0.743	25.8	10	
0.848	25.5	10	
0.952	24.9	10	
1.058	24.2	10	
1.163	23.4	10	
1.268	22.4	10	
1.372	21.2	8	
1.477	9999.0	4	

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 14 20 18 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	4.8	320	-1.93	-0.43	-0.11	7	8	7	24	28	26
0.214	4.8	320	-1.92	-0.41	-0.09	7	8	7	28	39	28
0.311	5.1	325	-1.89	-0.49	0.05	8	8	7	25	24	24
0.407	5.5	324	-2.24	-0.69	-0.17	7	8	7	26	34	26
0.504	6.2	325	-2.40	-0.67	-0.06	8	8	8	22	21	20
0.601	6.5	320	-2.53	-0.48	-0.05	8	8	8	13	11	15
0.697	4.9	294	-1.90	0.45	-0.08	8	8	8	7	8	9
0.794	4.6	270	-1.47	1.08	-0.10	8	8	8	7	8	2
0.891	4.8	271	-1.31	1.31	0.14	8	8	7	1	-1	-2
0.987	4.8	258	-1.00	1.65	0.16	8	8	7	-4	-4	2
1.084	5.3	252	-0.97	1.86	0.12	8	8	8	-3	-2	-5
1.181	5.8	250	-0.98	2.12	0.18	7	8	7	-8	-4	-10
1.277	6.9	254	-1.42	2.30	0.07	8	6	8	-2	-9	-13
1.374	6.8	266	-1.74	2.04	0.19	8	8	8	-3	-13	-9
1.471	6.0	264	-1.52	1.79	0.12	8	8	8	-6	-10	-2
1.567	5.5	262	-1.37	1.66	0.06	8	8	8	-2	-3	-9
1.664	5.6	263	-1.35	1.72	0.15	8	8	8	-5	-5	-4
1.760	3.7	268	-0.96	1.09	0.13	8	8	8	-5	-9	7
1.857	3.0	288	-1.00	0.54	0.10	8	8	8	1	2	6
1.954	3.1	289	-1.06	0.52	0.09	8	8	8	7	7	-4
2.050	3.5	294	-1.20	0.50	0.13	8	8	8	6	4	-6
2.147	3.5	297	-1.20	0.44	0.14	8	8	8	-0	-5	-4
2.244	2.9	304	-0.97	0.28	0.17	8	8	8	-3	-6	-2
2.340	2.9	295	-0.92	0.45	0.18	8	8	8	-3	-3	-1
2.437	3.2	278	-0.93	0.81	0.15	8	8	8	-2	-1	-0
2.534	3.8	272	-1.01	1.05	0.16	8	8	8	-3	-1	-0
2.630	4.0	274	-1.12	1.06	0.16	8	8	8	1	-2	-11
2.727	4.7	290	-1.29	1.06	0.48	8	8	8	2	0	-16
2.824	4.6	273	-1.42	1.08	0.64	8	8	4	-1	-2	-18
2.920	4.1	274	-1.31	0.94	-9.22	8	8	3	-7	-9	-17
3.017	3.3	267	-0.95	0.88	3.06	8	7	2	-13	-14	-15
3.114	9999.0	9999	-0.99	4.40	7.19	6	2	2	-16	-20	-20

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 14 30 26 0

4

10 5 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	28.8	10
0.218	28.6	10
0.322	28.1	10
0.428	27.3	10
0.533	26.6	10
0.637	26.3	10
0.743	25.9	10
0.848	25.5	10
0.952	25.0	10
1.058	24.2	10
1.163	23.3	10
1.268	22.3	9
1.372	21.4	9
1.477	20.1	6

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 14 35 12 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	6.3	323	-1.84	0.03	0.61	7	8	8	27	22	33
0.214	5.9	321	-1.79	0.05	0.53	7	8	8	30	25	39
0.311	6.0	324	-1.94	-0.26	0.35	7	8	8	30	23	32
0.407	6.2	322	-1.99	-0.14	0.41	7	7	8	28	24	34
0.504	6.9	328	-2.40	-0.70	0.16	7	8	8	22	17	24
0.601	6.2	323	-2.45	-0.63	-0.11	8	8	8	16	13	17
0.697	5.8	312	-2.23	-0.03	0.04	8	8	8	11	11	8
0.794	5.5	299	-1.89	0.60	0.22	8	8	8	6	6	1
0.891	5.2	285	-1.63	1.06	0.22	8	8	8	4	2	-4
0.987	5.4	272	-1.46	1.48	0.21	8	8	8	-4	-3	-8
1.084	5.3	265	-1.26	1.69	0.23	8	8	8	-8	-3	-8
1.181	5.1	259	-1.04	1.79	0.25	8	8	8	-3	-7	-5
1.277	6.1	256	-1.24	2.08	0.17	7	8	8	-0	2	-9
1.374	6.6	254	-1.36	2.22	0.07	8	8	8	-2	4	3
1.471	6.7	259	-1.61	2.06	0.03	8	8	8	-8	-6	-4
1.567	6.0	257	-1.40	1.90	-0.00	8	8	8	-5	-8	-10
1.664	5.8	258	-1.45	1.70	-0.06	8	8	8	-7	-8	3
1.760	3.0	267	-0.94	0.73	-0.08	8	8	8	-6	-4	9
1.857	3.4	275	-1.18	0.65	-0.10	8	8	8	5	6	1
1.954	3.5	282	-1.25	0.60	-0.04	8	8	8	7	7	-10
2.050	3.7	285	-1.33	0.57	-0.04	8	8	8	4	2	-10
2.147	3.6	292	-1.33	0.42	-0.00	8	8	8	-4	-8	-5
2.244	2.6	295	-0.98	0.29	0.01	8	8	8	-6	-7	-4
2.340	2.7	288	-0.96	0.42	0.02	8	8	8	-2	19	-5
2.437	3.1	276	-1.03	0.63	-0.04	8	8	8	-1	12	-1
2.534	3.7	269	-1.15	0.90	-0.05	8	8	8	-3	-1	-6
2.630	4.1	264	-1.26	1.01	-0.15	8	8	8	-2	-3	-13
2.727	4.5	271	-1.47	1.02	-0.11	8	8	8	-1	-4	-14
2.824	4.8	277	-1.56	1.03	-0.24	8	8	4	-6	-9	-15
2.920	3.9	278	-1.28	0.79	-9.69	8	7	2	-11	-13	-18
3.017	9999.0	9999	-1.15	0.56	-8.71	8	4	3	-15	-17	-17
3.114	9999.0	9999	-1.16	-9.02	-0.10	5	2	3	-17	-18	-19

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 14 45 20 0

4

10 5 2.0

10 32 700 20

409.6 1 1600 14 700

0.112 29.2 10

Height (km)	Virtual Temp. (°C)	
0.218	28.8	10
0.322	28.3	10
0.428	27.8	10
0.533	27.2	10
0.637	26.5	10
0.743	25.7	10
0.848	25.0	10
0.952	24.5	10
1.058	23.9	10
1.163	23.2	10
1.268	22.2	7
1.372	9999.0	5
1.477	9999.0	4

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 14 50 07 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	3.9	325	-1.14	-0.08	0.34	7	8	7	27	21	25
0.214	3.9	332	-1.10	-0.25	0.33	7	8	7	33	22	30
0.311	4.7	323	-1.38	-0.02	0.44	7	7	7	27	21	25
0.407	4.7	325	-1.47	-0.17	0.34	7	7	8	29	22	28
0.504	5.8	325	-1.97	-0.38	0.22	7	7	8	24	19	22
0.601	6.2	329	-2.18	-0.64	0.15	8	8	8	20	19	20
0.697	5.8	326	-2.07	-0.53	0.11	8	8	8	17	15	16
0.794	5.5	316	-2.10	-0.18	0.05	8	8	8	12	6	9
0.891	5.6	283	-2.29	0.64	-0.37	8	8	8	7	4	4
0.987	5.6	282	-1.91	1.03	-0.00	8	8	8	4	1	-3
1.084	5.5	261	-1.71	1.32	-0.34	8	8	7	-2	-5	-4
1.181	5.7	265	-1.81	1.35	-0.26	8	8	7	-9	-8	0
1.277	5.7	257	-1.51	1.62	-0.19	7	8	7	-8	-11	-8
1.374	5.9	248	-1.30	1.84	-0.23	7	7	8	-9	-11	-7
1.471	6.4	254	-1.66	1.80	-0.29	8	8	8	-8	-9	-8
1.567	6.3	258	-1.61	1.84	-0.09	8	8	8	-9	-10	-3
1.664	5.2	256	-1.32	1.55	-0.12	8	8	8	-3	-5	-3
1.760	4.7	256	-1.17	1.38	-0.11	8	8	8	-1	-4	9
1.857	2.9	274	-1.00	0.56	-0.10	8	8	8	5	2	5
1.954	2.9	277	-1.11	0.48	-0.16	8	8	8	9	9	-6
2.050	3.2	279	-1.25	0.46	-0.19	8	8	8	5	7	-6
2.147	3.1	282	-1.24	0.42	-0.17	8	8	8	-4	-0	-3
2.244	2.4	287	-1.01	0.21	-0.17	8	8	8	-5	-7	-5
2.340	2.3	282	-0.93	0.29	-0.14	8	8	8	-1	-3	-8
2.437	2.7	277	-0.99	0.44	-0.13	8	8	8	-2	-2	-2
2.534	3.4	271	-1.16	0.69	-0.14	8	8	8	-5	-3	-7
2.630	3.9	266	-1.31	0.87	-0.21	8	8	8	-2	-2	-13
2.727	4.4	270	-1.48	0.95	-0.17	8	8	8	-2	-3	-13
2.824	4.5	277	-1.47	0.94	-1.39	8	8	2	-7	-7	-19
2.920	3.8	277	-1.25	0.82	1.30	8	8	3	-10	-11	-19
3.017	3.5	273	-1.08	0.81	-8.84	8	7	2	-12	-16	-19
3.114	9999.0	9999	-1.15	0.17	-7.83	8	4	3	-15	-19	-20

Mosquito Lagoon
Latitude/Longitude 28.60 80.59 3
Date 95 05 14 **Time(hrs., min., secs.)** 15 00 15 0
5
11 6 2.0
10 32 700 20
409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	28.7	11
0.218	28.3	11
0.322	27.9	11
0.428	27.4	11
0.533	26.8	11
0.637	26.4	11
0.743	26.1	11
0.848	25.7	11
0.952	25.1	11
1.058	24.3	11
1.163	23.5	11
1.268	22.7	11
1.372	21.7	11
1.477	20.3	7

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 15 05 29 0

9

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	5.7	337	-1.81	-0.82	0.18	8	7	6	28	22	39
0.214	3.7	329	-1.73	-0.84	-0.38	8	7	6	32	27	40
0.311	4.7	323	-1.89	-0.54	-0.12	8	7	7	30	23	40
0.407	4.4	327	-1.92	-0.75	-0.28	8	7	7	31	23	35
0.504	5.2	322	-1.98	-0.41	0.02	8	7	8	29	18	27
0.601	5.4	316	-2.18	-0.32	-0.10	7	7	8	24	17	22
0.697	6.3	318	-2.44	-0.35	0.01	8	7	8	18	15	16
0.794	6.4	310	-2.44	0.03	0.05	8	7	8	13	9	9
0.891	6.7	297	-2.48	0.67	0.07	8	7	7	9	4	3
0.987	5.9	279	-2.09	1.05	-0.13	8	7	7	2	4	4
1.084	5.8	268	-1.92	1.29	-0.27	8	7	7	-3	-3	6
1.181	5.8	263	-1.78	1.44	-0.25	8	7	8	-2	-3	5
1.277	6.7	264	-1.86	1.85	-0.03	8	7	8	1	-3	-7
1.374	6.8	264	-1.67	2.11	0.19	8	7	7	-4	-3	-10
1.471	6.8	265	-1.65	2.10	0.24	8	7	8	-9	-10	-8
1.567	6.2	266	-1.55	1.88	0.22	8	7	8	-9	-11	-2
1.664	5.4	269	-1.37	1.64	0.25	8	7	8	-3	-7	-5
1.760	5.0	269	-1.27	1.49	0.22	8	7	8	-2	-4	2
1.857	3.3	280	-0.92	0.85	0.21	8	7	8	1	-5	8
1.954	3.1	287	-0.97	0.61	0.14	8	7	8	8	6	-2
2.050	3.3	279	-1.13	0.62	-0.04	8	7	8	6	7	-11
2.147	3.4	277	-1.21	0.61	-0.11	8	7	8	-3	0	-5
2.244	2.2	281	-0.88	0.31	-0.13	8	7	8	-5	-6	-8
2.340	2.3	297	-0.84	0.22	0.02	8	7	8	-0	-3	-11
2.437	2.5	290	-0.95	0.32	-0.02	8	7	8	-1	-4	-2
2.534	3.3	288	-1.15	0.53	0.06	8	7	8	-6	-7	-5
2.630	4.1	280	-1.37	0.81	0.02	8	6	8	-4	-4	-10
2.727	4.5	279	-1.50	0.93	0.01	8	6	8	-3	-4	-11
2.824	4.5	277	-1.48	0.94	-0.18	8	7	4	-6	-7	-17
2.920	3.7	281	-1.28	0.70	4.23	8	7	3	-8	-10	-18
3.017	3.3	288	-1.18	0.48	-5.71	8	6	2	-10	-13	-18
3.114	9999.0	9999	-1.20	1.01	1.08	8	2	3	-12	-19	-19

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 15 15 12 0

5

11 6 2.0

10 32 700 20

409.6 1 1600 14 700

Height (km)	**Virtual Temp.** (°C)	
0.112	28.4	11
0.218	28.2	11
0.322	27.9	11
0.428	27.4	11
0.533	26.8	11
0.637	26.2	11
0.743	25.7	11
0.848	25.6	11
0.952	25.0	11
1.058	24.1	11
1.163	23.4	11
1.268	22.6	11
1.372	21.5	9
1.477	20.6	7

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 15 20 27 0

9

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	5.1	335	-1.60	-0.65	0.22	7	5	6	30	32	26
0.214	4.3	317	-1.54	-0.08	0.12	8	6	6	35	39	29
0.311	4.9	325	-1.58	-0.25	0.27	7	6	6	31	28	27
0.407	4.2	322	-1.53	-0.28	0.07	8	5	7	32	35	28
0.504	3.8	312	-1.60	-0.16	-0.13	8	7	7	25	21	28
0.601	5.6	316	-2.04	-0.11	0.13	8	7	8	22	15	23
0.697	6.0	307	-2.39	0.07	-0.05	8	7	8	19	12	16
0.794	6.8	300	-2.70	0.37	-0.08	8	7	8	14	11	16
0.891	6.8	295	-2.70	0.55	-0.15	8	7	8	7	6	9
0.987	6.2	282	-2.31	0.96	-0.19	8	7	8	2	1	3
1.084	6.1	275	-2.10	1.21	-0.16	8	6	8	3	6	2
1.181	6.5	275	-2.14	1.41	-0.04	8	7	8	2	1	-4
1.277	6.4	272	-1.95	1.57	0.03	8	7	8	-4	-5	-7
1.374	6.8	267	-1.86	1.90	0.08	8	7	8	-9	-9	-11
1.471	6.6	265	-1.74	1.91	0.08	7	7	8	-10	-11	-3
1.567	5.8	271	-1.64	1.57	0.16	8	7	8	-5	-7	0
1.664	5.4	268	-1.38	1.60	0.20	8	7	8	1	-2	-3
1.760	4.9	262	-1.16	1.54	0.14	8	7	8	1	-2	4
1.857	3.5	269	-0.86	1.06	0.18	8	7	8	2	-3	8
1.954	3.3	284	-0.96	0.75	0.20	8	7	8	8	6	-1
2.050	3.6	274	-1.15	0.82	-0.01	8	7	8	5	8	-6
2.147	3.4	270	-1.10	0.79	-0.08	8	7	8	-2	3	-5
2.244	2.5	272	-0.82	0.52	-0.07	8	7	8	-4	-3	-6
2.340	2.3	288	-0.83	0.33	0.00	8	7	8	-3	-3	-11
2.437	2.6	290	-0.96	0.33	-0.01	8	7	8	-5	-3	-1
2.534	3.4	288	-1.23	0.51	-0.00	8	7	8	-5	-5	-9
2.630	4.2	289	-1.43	0.70	0.12	8	7	7	-2	-4	-13
2.727	4.7	287	-1.67	0.76	0.05	8	7	8	-3	-7	-11
2.824	4.5	278	-1.48	0.94	0.34	8	7	3	-9	-13	-17
2.920	4.0	272	-1.23	0.97	9.27	8	6	4	-8	-15	-17
3.017	9999.0	9999	-1.28	-3.98	0.65	8	3	3	-11	-19	-18
3.114	9999.0	9999	-1.25	5.31	6.58	8	4	2	-14	-17	-19

Mosquito Lagoon
Latitude/Longitude 28.60 80.59 3
Date 95 05 14 **Time(hrs., min., secs.)** 15 30 09 0
5
11 6 2.0
10 32 700 20
409.6 1 1600 14 700

Height (km)	Virtual Temp. (°C)	
0.112	30.2	11
0.218	30.1	11
0.322	29.7	11
0.428	28.9	11
0.533	27.8	11
0.637	27.1	11
0.743	26.3	11
0.848	25.9	11
0.952	25.2	11
1.058	24.3	11
1.163	23.5	11
1.268	22.5	11
1.372	21.4	11
1.477	20.5	11

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 15 35 24 0

10

8 7 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	4.3	343	-1.33	-0.83	0.08	8	5	7	29	31	29
0.214	3.4	355	-1.08	-1.10	-0.18	8	6	6	33	30	34
0.311	9999.0	9999	-1.52	-1.78	-0.39	8	4	7	31	33	32
0.407	3.7	346	-1.22	-0.89	-0.05	7	6	7	31	32	32
0.504	5.0	335	-1.71	-0.75	0.07	8	5	7	30	25	28
0.601	4.6	319	-1.75	-0.25	0.02	8	6	7	25	17	24
0.697	4.0	295	-1.78	0.16	-0.28	7	5	7	19	12	32
0.794	5.1	302	-2.07	0.21	-0.09	7	6	6	12	11	20
0.891	6.7	303	-2.58	0.33	0.02	7	6	7	9	6	9
0.987	7.1	296	-2.63	0.75	0.07	8	7	8	9	6	10
1.084	6.9	285	-2.29	1.28	0.17	8	7	8	7	6	4
1.181	6.9	282	-2.06	1.57	0.32	8	7	7	1	1	-6
1.277	6.0	272	-1.56	1.73	0.31	8	7	8	-2	-0	-7
1.374	6.0	270	-1.50	1.82	0.33	8	7	8	-4	-7	-7
1.471	6.4	272	-1.68	1.85	0.34	8	7	8	-9	-9	1
1.567	5.5	275	-1.47	1.55	0.32	8	7	8	-3	-3	4
1.664	5.1	269	-1.22	1.62	0.33	8	7	8	2	2	1
1.760	4.8	265	-1.05	1.58	0.29	8	7	8	-1	1	4
1.857	3.2	265	-0.61	1.17	0.30	8	7	8	2	-1	8
1.954	2.8	279	-0.71	0.82	0.26	8	7	8	8	5	-1
2.050	3.2	275	-0.89	0.85	0.14	8	7	8	5	6	-7
2.147	2.9	275	-0.90	0.65	0.01	8	7	8	-1	1	-10
2.244	1.7	267	-0.57	0.34	-0.11	8	7	8	-3	-0	-7
2.340	1.7	272	-0.58	0.33	-0.07	8	7	8	-1	-1	-11
2.437	1.9	271	-0.69	0.37	-0.12	8	7	8	-2	-1	-11
2.534	2.7	284	-0.96	0.46	-0.02	8	7	3	-6	-4	-15
2.630	3.5	287	-1.26	0.54	0.40	8	7	4	-7	-7	-16
2.727	4.1	284	-1.50	0.65	-0.07	8	7	6	-8	-11	-13
2.824	4.0	284	-1.41	0.69	-9.52	8	7	3	-12	-15	-17
2.920	4.1	268	-1.17	1.07	0.97	8	5	3	-13	-16	-19
3.017	9999.0	9999	-1.33	1.03	-7.14	7	4	3	-14	-17	-19
3.114	9999.0	9999	-1.07	-7.62	-2.44	5	2	3	-16	-18	-18

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time(hrs., min., secs.)** 15 45 01 0

5

10 5 2.0

10 32 700 20

409.6 1 1600 14 700

0.112 30.3 10

Height (km)	**Virtual Temp. (°C)**
0.218	30.1 10
0.322	29.1 10
0.428	28.3 10
0.533	27.5 10
0.637	26.2 10
0.743	25.3 10
0.848	24.6 10
0.952	23.9 10
1.058	23.5 10
1.163	22.9 10
1.268	22.0 10
1.372	21.1 10
1.477	20.3 10

Mosquito Lagoon

Latitude/Longitude 28.60 80.59 3

Date 95 05 14 **Time (hrs., min., secs.)** 15 50 18 0

10

8 8 8 5 5 5 2.0 2.0 2.0

188 188 42 42 700 700 43 43

10.1 10.1 1 1700 1700 32 32 700 700

130 67 220 67

Height (km)	Wind Speed (m/sec)	Wind Dir. (deg.)	Oblique Velocities (m/sec)		Vertical Velocity (m/sec)	# of samples (8 max.)			Signal to Noise Ratio		
0.117	2.4	348	-0.53	-0.37	0.22	7	7	7	23	26	25
0.214	2.2	345	-0.64	-0.43	0.06	8	7	8	27	28	28
0.311	2.9	348	-0.46	-0.26	0.47	8	6	7	24	27	26
0.407	1.6	339	-0.56	-0.31	-0.02	8	6	8	25	29	28
0.504	2.0	315	-0.70	0.01	0.08	7	6	7	25	31	27
0.601	2.1	271	-0.68	0.45	-0.06	6	6	8	33	27	32
0.697	3.1	272	-1.13	0.57	-0.18	8	6	8	22	21	23
0.794	4.2	284	-1.51	0.65	-0.05	8	6	8	14	15	13
0.891	5.9	291	-1.88	1.07	0.34	8	6	7	6	10	10
0.987	6.4	289	-2.06	1.18	0.30	8	7	8	6	8	8
1.084	6.6	279	-1.88	1.68	0.38	8	7	8	2	6	5
1.181	6.5	267	-1.65	1.92	0.22	8	8	8	-3	-0	7
1.277	6.1	273	-1.57	1.75	0.35	8	8	8	2	0	7
1.374	6.5	271	-1.68	1.91	0.33	8	7	8	3	4	11
1.471	6.3	267	-1.55	1.91	0.26	8	8	8	3	2	8
1.567	5.2	266	-1.20	1.70	0.31	8	8	8	5	3	6
1.664	4.6	264	-0.98	1.57	0.31	8	8	8	6	5	2
1.760	4.5	256	-0.96	1.48	0.08	8	8	8	3	3	2
1.857	3.6	261	-0.89	1.08	0.03	8	8	8	2	1	9
1.954	3.2	266	-1.04	0.75	-0.14	8	8	8	7	7	5
2.050	3.5	262	-1.21	0.73	-0.32	8	8	8	5	9	9
2.147	3.2	261	-1.12	0.64	-0.33	8	8	8	1	5	5
2.244	2.4	262	-0.92	0.41	-0.32	8	8	8	-1	0	-1
2.340	2.0	266	-0.89	0.23	-0.34	8	8	8	-3	-3	-3
2.437	2.2	277	-1.08	0.12	-0.38	8	8	8	-4	-5	-5
2.534	3.0	296	-1.39	0.05	-0.26	8	8	8	-4	-6	-11
2.630	4.3	305	-1.78	0.05	-0.10	8	8	6	-6	-6	-16
2.727	4.9	303	-1.98	0.17	-0.09	8	8	8	-9	-12	-12
2.824	5.1	296	-1.91	0.49	-0.24	8	6	4	-12	-17	-13
2.920	4.2	295	-1.57	0.41	2.06	8	6	3	-11	-16	-18
3.017	4.2	311	-1.64	-0.03	9.82	8	5	2	-10	-14	-17
3.114	4.4	324	-1.68	-0.41	-1.43	7	6	3	-12	-16	-16